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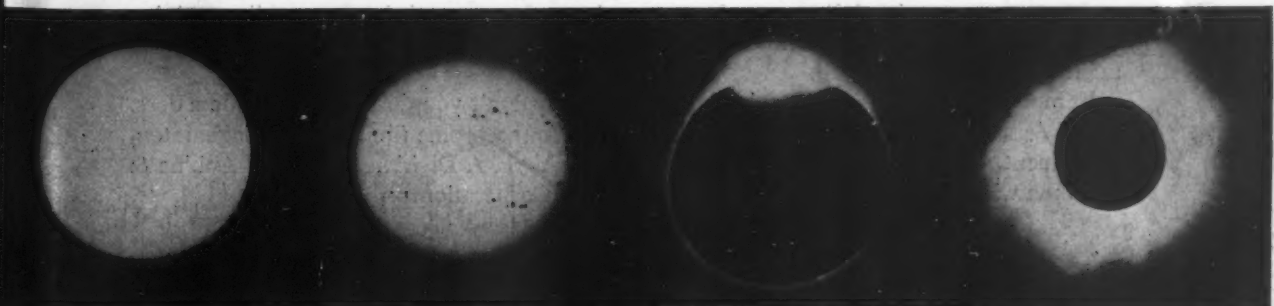
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Mrs. Paul Seamans, of Gill, Massachusetts, saw this picture 60 seconds after she took it with her Polaroid Land Camera.



Mr. W. A. Secor, of Cincinnati, Ohio, saw this picture just 60 seconds after he took it with his Polaroid Land Camera.

Allen Cohen of Long Island City, New York, saw this picture 60 seconds after he took it with his Polaroid Land Camera.

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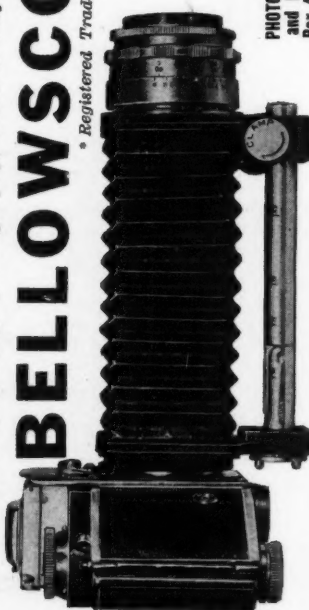


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modern PHOTOGRAPHY

SEPTEMBER 1960, VOL. 24, NO. 9

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MARTIN E. SIEGEL, Business Mgr.

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183. His 12 biggest hits. Begin the Beguine, Star Dust.



148. With Sinatra, etc. Marie, Song of India, Who?, others.



7. Breath-taking new recording of best-selling suite from dramatic TV score.



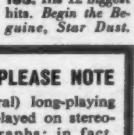
222. 16 favorites, superb chorus. De luxe album with song book.



10. Key highlights from Tchaikovsky's enchanting masterpiece for ballet.



58. Mood guitar with strings. Exotica, The Three Belles, Greenleaves, 12 small.



212. Mr. Guitar's first dance disc! Night Train, Till There Was You, etc.



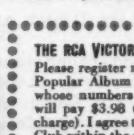
19. Lush, exotic instrumentals. Valencia, Peanut Vendor Delicado, others.



9. Operetta film stars remake their 12 biggest hits. Indian Love Call, etc.



24. September Song, Warsaw Concerto, Too Young, Tenderly, Diane, Charmaine.



37. Pianist's trio plays Summertime, The Man I Love, All of You, Cherry, etc.



48. Riotous musical satire, slapstick; very commentary by TV's Henry Morgan.



220. Hit album of jazz themes from TV series by Henry (Peter Gunn) Mancini.



204. Hawaii in hi-fi! 12 all-time Hawaiian hits: Sweet Leilani, Aloha Oe.



202. Film soundtrack. Come Prima, Vesti la giubba, O sole mio. Ave Maria.



100. 12 Gershwin treasures in fresh, modern manner. A big best seller.



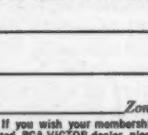
54. 15 varied strutters. 76 Trombones, Semper Fidelis, Colonel Bogey, others.



12. New remakes of their biggest hits. Jalousie, Skaters Waltz, Liebestraum.



212. Mr. Guitar's first dance disc! Night Train, Till There Was You, etc.



48. Riotous musical satire, slapstick; very commentary by TV's Henry Morgan.



200. "Lazy-daddy" stylings of Linda, St. Louis Blues, Begin the Beguine, etc.



221. Sun's biggest hits—new sound! Twilight Time, To Each His Own, etc.



14. Fresh versions of 12 harmony hits. Paper Doll, To Each His Own, Cool Water.



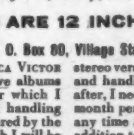
54. 15 varied strutters. 76 Trombones, Semper Fidelis, Colonel Bogey, others.



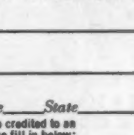
99. Exciting, exotic African rhythms and themes, sometimes blended with jazz.



65. Dancing-listening hi-fi big-band surprise. Baubles, Bangles and Beads, etc.



228. Comedy routine by popular guest on the Jack Paar TV show. Monstrously.



206. Good-time Dixieland. Colonel Bogey, Shake It and Break It, more.



215. New recording of the Rhapsody, American in Paris. Earl Wild, pianist.



211. Cha-cha for beginners or experts. Big-band sounds, hi-fi effects.



1. Melachrino plays Autumn Leaves, Star Dust, While We're Young, Estrellita.



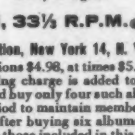
99. Exciting, exotic African rhythms and themes, sometimes blended with jazz.



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206. Good-time Dixieland. Colonel Bogey, Shake It and Break It, more.



206. Good-time Dixieland. Colonel Bogey, Shake It and Break It, more.



225. Belafonte and his folk singers do spirituals; tender, exuberant, exciting!



210. Cha-cha standards. Paper Doll, Isle of Capri, If You Knew Susie, etc.



99. Exciting, exotic African rhythms and themes, sometimes blended with jazz.



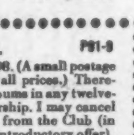
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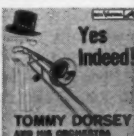
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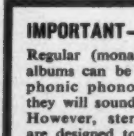
145. In the Mood, Moonlight Serenade, Tuxedo Junction, etc.



124. 14 million-sellers. Prisoner of Love, Temptation.



148. With Sinatra, etc. Marie, Song of India, Who?, others.



148. With Sinatra, etc. Marie, Song of India, Who?, others.



183. His 12 biggest hits. Begin the Beguine, Star Dust.



183. His 12 biggest hits. Begin the Beguine, Star Dust.

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Regular (monaural) long-playing albums can be played on stereophonic phonographs; in fact, they will sound better than ever. However, stereophonic albums are designed to be played ONLY ON STEREOPHONIC EQUIPMENT.

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Coffee Break WITH THE EDITORS

THIS MONTH'S COVER . . .

The top picture band introduces our new Bonus section, all 24 pages of it, which is the first of two devoted to a new book, *Color Photography Today*. The object shown on the cover is a wedge spectrogram, and except for hinting that a wedge spectrogram is made with a wedge spectrograph, we'll leave you to read the Bonus section following page 90 and find out all about it for yourselves.

In the middle of the cover, Hal Reiff tries out three different focal-length lenses for a portrait. Which is best? This is one of the important questions that are dealt with in the article on portrait photography on page 64.

Finally, a 93-million-mile leap to the sun, which most of us usually try to keep out of our lenses. There's a wide variety of astronomical objects that are fascinating to photograph, and the article on page 58 shows how you can do it with the equipment you already own or a few inexpensive additions.

DARKROOM-TRAILER, ANYONE? . . .

Even in these days of ultra-portable picture-taking equipment, the poor photographer cannot usually do anything about developing and printing the results until he has trekked back to his lair. This problem becomes acute for a photographer who operates for five months of the year at distances of hundreds of miles from his lair.

The chief photographer of a world-famous circus recently designed a traveling darkroom that enables him to work comfortably wherever the circus takes him. The man in question, Zachary Bloom, who is also President of the Dar-Zach Studio Labs Inc., produced a sleek white and red trim trailer that's equipped to develop, print, dry and mount any negative format from 35mm to 8 x 10 up to a print size of 24 x 27. Mr. Bloom showed us around the trailer, and we were impressed.

The interior of the trailer stands 7½ ft. high—more than the norm for ordinary trailers, but Mr. Bloom pointed out that he had based the design on his experience of what was necessary, and he is a big man. The interior is fitted with both air-conditioning and electric heating. Just inside the doorway is a small reception office. Beyond that comes the drying and mounting room; then a longish darkroom, with four enlargers of different formats along one side, a 6½-ft. stainless steel sink and automatic print washers along the other; and finally a smaller darkroom for color as well as black-and-white processing. The doors between these rooms are light-taped and

fitted with automatic safety switches.

It would take too much space to list all the refinements and conveniences of Mr. Bloom's trailer. Let's just mention that the four enlargers can be turned on their posts to project onto the floor for blowups larger than 24 x 27; that the water outlets are strategically placed and thermostatically controlled; and that the three-wall timers are fitted with sound signals.

While we stood groggy with envy, Mr. Bloom fired some statistics at us. Five men can work in the trailer at the same time; one man can turn out the equivalent of 20,000 single-weight glossy prints per year, or 75 per day; and it takes only 30 minutes to stow everything safely away, disconnect water and electricity supplies, and go



WILLIAM JOHNSON

Mr. Bloom in his traveling darkroom.

on the road. The trailer has already been road-tested over several hundred miles, and there were no disorders.

One final statistic, for anyone who might like to have a darkroom-trailer of his own (and Mr. Bloom is prepared to make them to order). This luxury model cost \$27,000.

DISSIMULATION . . .

We have a friend whose job at a very large aircraft plant is designing and producing simulators. For those of us who are uninformed about this new American business venture, we explain that simulators are real-life boys' dreams come true. Step into a simulator and you can fly a Boeing 707B or torpedo a ship, all without leaving the confines of your home base. Before you race out to your nearest toy store to buy one for yourself and one for the kids we hasten to explain that simulators cost upwards of a million dollars apiece and are bought chiefly by airlines and governments (friendly, we hope) to speed pilot- (air and under-sea) training.

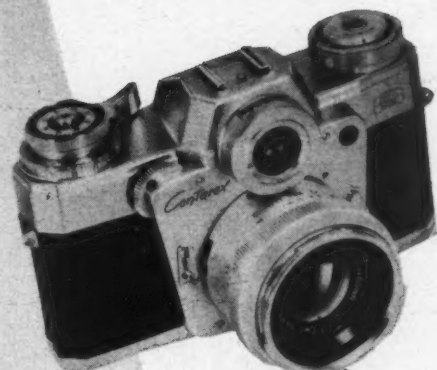
Our story involves one of the first aircraft simulators used for teaching pilots to land a large aircraft on a small landing field near a typical American town. Seated in the pilot's
(Continued on page 25)

Top value

in a wide
price range



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CONTAFLEX



CONTAX



SYMBOLICA II



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CONTINETTE

The Zeiss Ikon line of 35mm cameras meets practically any requirement, *with emphasis on quality and dependability.*

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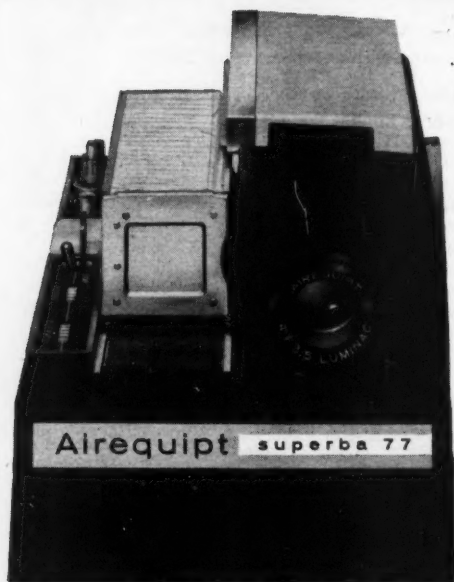
CONTINETTE—a new 35 with Zeiss Lucinar f/2.8, 50mm lens. \$44.

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Literature on request.

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you are ready
for the

zenza

BRONICA

2¼ square,
single-lens reflex



When a man is ready to invest \$489.50 in a camera, his choice deserves the most serious consideration. There are two cameras in the field priced at \$489.50, both 2¼ square, single-lens reflexes. The following comparison table shows certain vital differences between these two cameras which should prove most valuable in helping you make your selection. One of these cameras is the Bronica. See if you can tell which.

	CAMERA 'X'	CAMERA 'Y'
shutter	between-the-lens	focal plane
speeds	1 sec. to 1/500th	10 sec. to 1/1250th
delayed action	approx. 10 sec.	adjustable: 1 to 10 sec.
lenses	interchangeable only when shutter is wound	interchangeable at any time
each lens requires shutter	yes	no
widest angle lens	60mm f5.6	50mm f3.5
normal lens focusing range	3½ ft. to infinity	19 inches to infinity
diaphragm action	stops down automatically for exposure — must wind shutter to reopen	automatically stops down for exposure — instantly reopens to full aperture.
instant-return automatic mirror	no shutter must be wound to reset mirror to focus position	yes automatically returns to focus position after exposure
film back interchangeability	to replace or interchange backs attention must be paid to whether film or shutter had been previously wound — and appropriate adjustment made	back may be replaced or interchanged without any attention to whether film or shutter has been wound. Camera responds automatically.
film loading	must observe visual indicator when winding to #1	automatically stops at #1 exposure position
safety film-slide	camera can be fired with slide slightly withdrawn (¼")	camera cannot be fired unless slide is completely withdrawn
film-slide lock	no slide readily removable when film back is off camera	yes slide cannot be withdrawn when film back is off camera
special film flatness device	none	automatic film tension system keeps film flat for exposure — relaxes when film is advanced
auto-reset exposure counter	no	yes
focusing lock	no	yes
price	\$489.50 with 80mm f2.8 lens	\$489.50 with 75mm f2.8 lens

There is one special Bronica feature which cannot go unmentioned. Interchangeable Auto-Nikkor lenses are standard Bronica equipment—supplied in normal focal length with the camera, and available in interchangeable wide-angle and telephotos. See the Bronica at your photo dealer this week. For complete details, write to Dept. MP9

LETTERS TO THE EDITOR

Cooke Strikes Back

Sirs:

Let me try to set the facts straight with reference to "Ivan The Photographer" and Mr. Daly, the "advanced amateur" whose letter you printed in your June 1960 issue.

To start with, Mr. Daly has chosen the time-honored method of quoting out of context and your answering statement did not fully clarify the matter.

I only referred to amateurs, both United States and Soviet, in order to establish the point that I was writing *not* about them, but about working professional photographers.

I am fully aware of the fact that there are many talented advanced amateurs in the San Francisco Bay area, just as there are everywhere else. Nothing could be further from my mind than to try to compete with them.

Mr. Daly's, and others', reasons for choosing not to be professionals are his own, and I sincerely hope he will stay an advanced amateur since the professional field is already too crowded. But let him remember that there also are lots of reasons why amateurs are not professionals besides their definite *ability* to take consistently good pictures.

New York, N. Y.

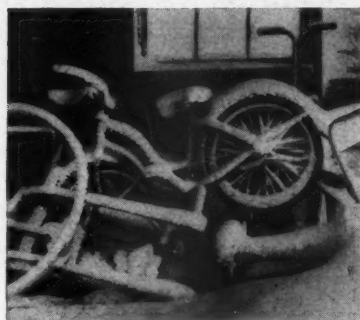
Jerry Cooke

Sees The Light

Sirs:

Having been an art director for several years endeavoring to do greater things in layout and design, I suddenly realized that art directors and clients could possibly be the culprits who were putting a pox on photographers (without realizing it). Most of the time I had been so concerned with the problems at my end of the photographer's camera, I didn't realize that some of

the things art directors do (and clients okay) might give a photographer ulcers, or a mental block against art directors and clients. These things could



AL WILSON

Made on the drawing board?

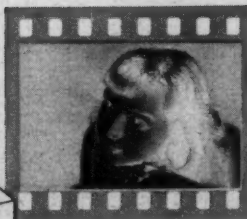
last forever and hinder the advance of better photos and better communication with the buying public.

I decided to buy a camera and find out what problems a photographer has at his end of the camera. About a year ago I bought a Rolleiflex. As a result I suddenly found a whole new world—out there where, up to this time, I thought I had been so observing.

To make a long story short, I would like to say I have come to understand the photographers' problems much

Introducing new improved Kodak Tri-X Pan Film!

The grain's finer, image detail sharper . . . the speed still sizzles



You'll see these improvements in the first enlargement you make from a new Kodak Tri-X Pan negative.

Blow up a typical 35mm negative to 16 x 20—or bigger. Check the

grain closely. Fantastic that it can be so fine in film so fast!

Then examine image detail. See a new sharpness, crispness along with excellent tonal rendition. And you can count on this new quality through a wide range of exposures.

Same famous speed

Under the new standard, Tri-X Pan Film is now rated at ASA 400 for both daylight and tungsten illumination.

It's the speed you need to shoot in low-level available light and still get revealing detail in shadow areas.

It's the kind of top speed that teams beautifully with a fast shutter to freeze action at its swiftest.

First chance you get, sample the capabilities of new Kodak Tri-X Pan Film, Improved Type, in your camera. Available now in 120, 127, 135, 620, and 828 sizes.

DARKROOM NOTES

Only change in handling new Kodak Tri-X Pan Film is a shorter development time. For example:

Using Kodak D-76 Developer (full strength) at 68 degrees, development time in a small tank is 8 minutes with agitation at 30-second intervals.

Using new Kodak Microdol-X Developer (full strength) at 68 degrees, development in a small tank is 11 minutes with agitation every 30 seconds.

The more you know about photography . . . the more you will count on Kodak

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

★ **PICTURE IT NOW—**
See it again and again

better. It has made me a better art director. I understand my photographers better as people, instead of just service figures. I feel that my photographers understand me better now that I am a confirmed camera carrier with a new eye for the world and the people in it. I recommend that every aspiring art director take this tranquilizing treatment—that of understanding his photographer.

Enclosed are a few samples of the pictures (about a thousand) I took my first year behind the camera. . . .
Rochester, N. Y. Al Wilson

The Real Eisenstaedt?

Sirs:

It's not often that I have found much material in your magazine guilty of undue one-sidedness; however, the short but merciless article entitled "Takes Soap To Make Soap" (April 1960 "Coffee Break"; about the TV dramatization of Margaret Bourke-White's fight against Parkinson's disease) literally screams for a letter of the sort I am now composing in all seriousness.

I fear the writer of that article is surely falling into a pit that is probably the biggest single tragedy that can befall a serious photographer. Namely the failure to recognize that people are all different and have the right to be judged by what they are

them to be. . . .

I also viewed the TV drama. I do not know the photographers who were and not what someone else would like "characterized" in that drama, but I am sure that they are fine, unselfish, deep-thinking people. And contrary to your impression, this was exactly the impression I got from the TV characterizations.

I consider myself average when it comes to being aware of what is going on around me, in as far as the way people act toward each other, both in real life and in drama. Frankly, I got no impression that Mr. Eisenstaedt was Miss Bourke-White's "boyfriend." I saw them merely as close friends. . . .

Furthermore, I definitely did not see Mr. Eisenstaedt portrayed as "dopey clown." Mr. Wallach may not have portrayed Mr. Eisenstaedt's personality to a tee, but he certainly put across the idea that he was an individual. . . .

Mr. Wallach is an actor; therefore, I feel he must be excused for any "boo-boos" in handling a camera—especially moving his camera, which means little to even the average photographer, even though the results would be drastic. How would you like to have tackled the technical problems of acting in this drama? Do you think you could have shown a superb job of acting? I doubt it and I know I couldn't have.

As for playing Chopin at midnight

in the hospital, I'll just bet that if Mr. Eisenstaedt had the time, desire, and ability to do this, he probably would. I picture his mind as being that flexible.

Photographers, especially the serious ones, seem to be a rather narrow-minded group at times. Allowing for practically no mistakes on anyone else's part, and making plenty themselves. When I find myself slipping into this form of self-worship, I remember a surgeon who, some time ago, performed a very delicate operation on me. There were no chances for error, faulty techniques, or "putting off until tomorrow." He did his job well, perfectly, if I might use that word. And yet that same man, while talking to me of photography, expressed little concern over a variation of one stop in his color work.

So you see, we all have different skills, and the sooner we all accept this fact, the sooner we will come close to understanding the divine plan of human nature. . . .

Denver, Colo.

W. M. Lovins

We asked Mr. Eisenstaedt to comment. First, he doesn't play the piano. Second, he thinks it in bad taste to play a piano at midnight in a hospital. And, if by any chance he were forced to play a piano at midnight in a hospital he doubts that he would play Chopin.—ED.



Kodak
TRADE MARK

PICTURES in a MINUTE

by JOHN WOLBARST

Using 3000-speed film outdoors: A substitute for the 4S Light Reducer that will improve your prints.



In previous columns and a major article I've gone into considerable detail about the amazing 3000-speed Polaroid Land Picture Roll. While its almost incredible speed

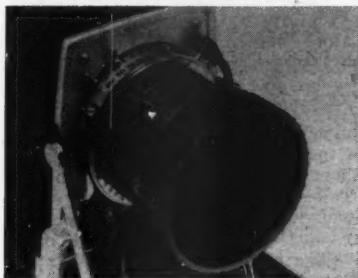
permits a wide variety of indoor pictures previously not possible with Polaroid Land cameras, this same light sensitivity has to be cut down drastically when the film is used outdoors in bright light. For this purpose Polaroid Corp. supplies a device known as the 4S Light Reducer or 4S filter. One is given free with every wink-

light sold. With the 4S filter in place, light entering the camera is reduced an amount equivalent to four exposure numbers. The 3000-speed film in the camera then performs more or less as 200-speed film would perform.

The 4S light reducer also has another function, at least on all cameras except the Pathfinders and Highlanders. A rubber ring attached to the filter acts as a light seal over the I-B switch on the front of the camera's shutter housing.

Use film speed, improve prints

Personally, I haven't been satisfied with this filter. Although it cuts down the light as desired, it does nothing to *improve prints*—it simply wastes the film speed, and my thrifty soul rebels at such a colossal waste. Also, with the 4S filter in place it's impossible to add another filter, such as the orange, to bring out white clouds in a dark sky. Nor can you add a lens hood, which I consider to be quite necessary



FILTER COMBINATION: When orange and polarizing filters are used as substitute for 4S Light Reducer, set them up as shown at *top*. With all models except Pathfinders and Highlanders, be sure to fit black tape (arrow) over I-B switch to prevent light leak. Lens hood can be fitted over filter combination, as shown on Pathfinder.

KODAK AUTOMATIC 35 CAMERA

Why a full set



This Kodak Automatic 35 is a true automatic-exposure camera. No surplus motions. No two-handed manipulations. One finger does all the work. You just aim and press the shutter release.

You can shoot from dawn to sundown without computing an exposure, without setting an *f/stop*. The electric eye does it for you.

Is this all? No. For unusual scenes, for specific effects, for contrasty lighting conditions, you want the freedom of *personal control*. You want the freedom to *choose* your shutter speed, meter your subject *selectively*, decide the exposure *yourself*. The controls on the Kodak Automatic 35 provide this all-important personal control whenever you want it.

• You can tune the film-setting dial to a higher or lower index, for color

with the Model 110A Pathfinder, although not so necessary with other camera models. So I did some experimenting, with good results.

An excellent substitute for the 4S filter is a combination of the orange filter and the polarizing filter supplied in standard Polaroid filter kits. You fit them on, one on top of the other, as shown *opposite*. These two filters, in combination, cut the light almost exactly the same amount as does the 4S filter. However, they act to bring out white clouds by darkening blue skies and can pep up contrast considerably in landscape scenes. And you can add a lens hood, if desired.

Make your own light trap

There's one minor extra chore, however. On all cameras except the Pathfinders and Highlanders, you must cover the I-B switch with a few bits of black tape to prevent light leaks through the switch.

With the filters in place, set your meter for 200 film speed. As the light dims (clouds, shade, twilight) you can remove one or both filters. If the meter (set to 200-speed) indicates an exposure of EV 14 or 15 (#5 or #6) remove one filter, reset the exposure meter to 800 and take another reading. If the indicated exposure goes below EV 14, remove both filters and set the meter for 3000-speed.—THE END

Timing and Editing Are the Key to an Impressive French Movie

Hiroshima, Mon Amour, the first full-length feature by the 38-year-old French director Alain Resnais, is as complex as a symphony, yet unfolds with the directness and simplicity of a march. Starting from a rich and difficult script in which there is little external action, Resnais uses all his technical resources not to ornament it but to translate it into genuine cinematic terms.

This, briefly, is the story. A French actress is in Hiroshima to take part in a documentary movie; she meets and has an affair with a Japanese architect whose family was killed by the atom bomb. This encounter awakens her memory of her first love—a German soldier occupying her home town of Nevers, who was killed during the liberation. Past and present fuse in her mind until she identifies the Japanese with her German lover. Finally, the two part: she has already forgotten the German's face, and soon she will forget the Japanese; only the remembered horror of war brought them together.

Resnais' most notable achievement is in showing the Frenchwoman's awakening memory of the events in Nevers—a superb example of planning, shooting and, above all, editing. (Resnais started his movie career in the cutting room—and he returned to it to supervise the editing of *Hiroshima, Mon Amour*.) He begins with an isolated shot, fairly near the opening, that lasts only four seconds. As the Frenchwoman gazes at the architect, lying face down on the bed with his right hand palm up, half open, the image switches to another, similar right hand; and the camera pans for just long enough to show that this man is dead. There is, at this point, no further explanation. Later, at night, when the architect and the actress sit in a quiet cafe, the story of her early, tragic love bursts from her. Here Resnais spurns the formal flashback; he introduces fragmentary scenes of the story out of chronological order—just as the memories would have spurted into the woman's

(Continued on page 25)

of controls on this automatic camera?

that's a bit richer or more pastel, whichever you prefer.

- You can meter any part of a subject, then set the lens selectively to favor that part.
- You can set the lens for more shadow detail or less.
- You can favor detail in the distance or in the darker foreground—choose softness or silhouette.
- You can focus swiftly by zones or precisely by footage scale.
- You can go quickly from automatic to manual and flash and synchro flash-fill.
- And always—you can enjoy the convenience of automatic-exposure-when-you-want-it.

Easy to understand, isn't it, why this camera is the *expert's* automatic? See it at your dealer's soon. Enjoy the convenience of automatic exposure plus the flexibility of full control—for only \$89.50.

CHECK THESE KODAK AUTOMATIC 35 FEATURES

Fast f/2.8 lens—fully automatic setting down to f/32.

Takes all popular 35mm films—indexes 10 to 160.

Automatic low-light signal—tells you when to switch to flash.

Drop-in film loading and automatic leader wind-off make loading trouble-free, fast.

Brilliant viewfinder outlines lens field with a bright frame, indicates parallax compensation.

Rapid zone focusing for close-ups, groups, scenes... plus footage scale marked from 2½ feet to infinity.

Single-stroke lever advances film, cocks shutter. Signal in viewfinder reminds you to wind film.



In sun (1) or shade (2) the electric eye meters the light, sets the lens aperture automatically. When the light is too dim, an automatic signal, visible in the viewfinder, tells you to switch to flash.

(3) In contrasty back or side lighting, you can meter your subject selectively, then set for the exposure level you want. It's the control you need, for example, for indoor pictures by available window light.

(4) For flash, you switch to manual control. EV cards tell correct flash exposure settings.

Price is list and subject to change without notice.

The more you know about photography... the more you will count on Kodak

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New Photo Books

SUBMINIATURE TECHNIQUE, by Paul Wahl, 128 pages, illustrated. Chilton Co. —Book Division, \$1.95*

After surveying the history of the subminiature, Wahl covers and compares the features of various cameras and presents detailed product reports on models currently available. The third and last section of the book describes subminiature shooting and darkroom techniques and contains a great deal of useful information. Despite the fact that this book is somewhat pedantically written, it should be helpful to every ultraminiature enthusiast.—P.C.

ARGUS 35MM PHOTOGRAPHY, by Burt Murphy, 128 pages, illustrated. Verlan Books, Inc., \$1.95*

Some useful information buried in a poorly edited hodge-podge which lacks a good table of contents and has no index at all. The vast scope of

varied types of cameras and equipment which Murphy attempts to cover makes it impossible to devote sufficient time and space to any of it.—H.K.

COLOR PHOTOGRAPHY, 162 pages, 71 color and 39 black-and-white pictures selected by the editors of *Popular Photography*, plus assorted text pieces. Ziff Davis, \$1.25

Although the title has been changed (from *Popular Photography's Color Annual* to *Color Photography*), the book remains true to its tried and tested formula. Altogether, it's an impressive package. The reproduction in both color and black-and-white is excellent. The layouts are simple and effective. The general quality of the photographs is superior.

My only criticism is that the photographs chosen do not seem to be particularly representative of the year. Two examples: enthusiastic as we are about Philippe Halsman's women,

many of them have been published before in photographic magazines or annuals; and a section on nudes (the pictures are pleasant and inoffensive enough) just rehashes the old color vs. black-and-white argument. Nevertheless, it's a good show, and would be at twice the price.—P.C.

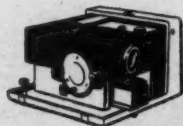
ASAHI CAMERA ANNUAL 1960, 200 pages, many black-and-white and color photographs, distributed by Ziff Davis, \$10

This Japanese annual is little better than the average yearbook published in this country. It includes, to my mind, precisely three truly memorable images: "Sash," by Masaya Nakamura; "Ruins," by Shozaburo Hiraoka; and "Road," by Shoji Ueda. The other photographs should, however, be of interest to American photographers as indicative of the Japanese choice of subject matter and their general approach to it. Unfortunately, all technical details are in Japanese.—P.C.

THE HORSE AND THE BLUE GRASS COUNTRY, text and photos by Bradley Smith, 160 pages. Doubleday & Co., \$8.50

Here's the book for those who want to learn about Kentucky thoroughbred horses from start to scratch. Over 125 color and black-and-white photographs and several paintings show the development of Kentucky horses, their

AUTOMATIC KODAK CAVALCADE PROJECTOR



Changes slides automatically...but lets you control the show

Put the Kodak Cavalcade Projector on "automatic"

and it shows up to 40 slides at 4-, 8-, or 16-second intervals. But—even while the Cavalcade Projector operates automatically—you have all these important controls:

Exclusive manual control wheel. Lets you go back and repeat a slide, skip ahead, or hold a slide on the screen. It works instantly! No fussing. No fiddling. No fooling around.

Remote control. Lets you change slides by push button from the end of a 12-foot remote-control cord... with extra 25-foot extensions if desired.

One-step editing. Want to reorient a slide? Just press the editing lever—up pops the slide.

Kodak Cavalcade Projector, Model 510, with hi-lo control of screen brilliance, f/2.8 lens, remote-control cord, spare condenser, \$159.50. Model 520 with f/3.5 lens, \$124.50.



Now—add synchronized sound to your Cavalcade slide shows. It's easy to do with the new Kodak Cavalcade Programmer and your tape recorder. Ask your Kodak dealer for a demonstration.



breeding, training, and racing in the Blue Grass country. The text is interesting and informal. Unfortunately, some of the color reproductions are too greenish and also slightly fuzzy. —L.H.

EUROPE FROM THE AIR, Edited by Emil Egli and Hans Richard Muller, with introduction by Salvador de Madariaga. 224 pages, copiously illustrated. Wilfred Funk, Inc., \$15*

We're left somewhat dizzy. After the Spanish philosopher, Salvador de Madariaga, has hustled us through geological and historical time, throwing off generalizations (provocative and banal) like sparks, the aerial photographs swing us pellmell over mountains, plains, cities. Most of the pictures are good and well reproduced. Some—of mountain villages under snow, of reindeer herds, of fertile valleys between barren peaks, of Dutch polders before and after reclamation—are superb. Except for a tendency to wordiness (due to translation), the captions are useful. The interest switches continually from the visual to the historical to the sociological to the geological to the archeological and—so we're dizzy. A fascinating book, if you have the curiosity and the stamina. An ideal present for the uncle who has been everywhere and has everything.—W.H.J.

THE WORLD OF WERNER BISCHOF, a Photographer's Odyssey. 74 photographs, 128 pages. E. P. Dutton & Co., \$7.95*

The World of Werner Bischof is a labor of love from his co-workers and friends to the memory of a fine photo-journalist who died tragically young—38 years—in an automobile accident.

The 74 photographs divided into 13 picture groups are in the form of a travelogue—from India to Indochina to Hong Kong to Korea to Japan through North and Central America to Peru, where Bischof died in 1954.

There are many stirring black-and-white and color images herein—Bischof was an acute observer as well as a magnificent technician. A beggar child with whitened face lies asleep in the burning sun under the outstretched arms and begging pangs of his elders; brilliantly gilded New York taxi cabs form sharply defined geometric patterns against the black asphalt of Park Avenue; a black-and-white dog nearly blends into the dirt street before two Mexicans eating lunch at the curb.

Unfortunately the mood isn't sustained. The book designers have placed only one picture on a page—a noble idea if each picture is an outstanding illustration. But many of the thirteen sections are picture stories. In order to make these stories coherent, less climactic explanatory photographs have, of necessity, been included.

While each of these, in the course of normal photojournalistic use, would have occupied a small space, here they are reproduced as large as the excellent display pictures. This interlarding of secondary visual material cuts dreadfully into the impact of the book. About a third to half of the volume is of such matter.

While Manuel Gasser's introduction and the biography in the back are tastefully written and highly informative, the captions for each photograph show vast gaps of information which the caption writer has sought to fill by describing what he thinks is happening in the photographs—one of the perils of producing books after the author or illustrator is no longer available for proper captions. Reproduction of the photographs is excellent.—H.K.

LONDON, by Tony Armstrong-Jones, 140 pages, illustrated. E. P. Dutton Co., \$5.95*

Since this book is likely to sell well for an incidental reason, we're happy to say that it thoroughly deserves to for its contents alone. No suave collection of picture postcards, this, but brilliantly chosen close-ups of Londoners in action. The familiar landmarks can be glimpsed here and there, but they are treated—rightly—as a setting. Tony Armstrong Jones has pho-

(Continued on page 24)

AUTOMATIC KODAK CINE SHOWTIME PROJECTOR

Threads itself and starts your show... automatically

The top sprocket feed of the automatic Showtime Projector takes the film gently from your fingers, threads it through the projector, loads it onto the take-up reel, and starts the show. *All automatically.*

Big, bright screenings. The Kodak Cine Showtime Projector can show your 8mm movies up to five feet wide. And even at that big size you have a picture that's brilliant—product of a new high-lumen lamp, special shutter and pulldown. A precision $\frac{3}{4}$ -inch f/1.6 lens keeps detail sharp.

Other fine Showtime Projector features: Controls for forward and reverse projection, "stills," and power rewind. 400-foot reel capacity for half-hour showings. Lifetime lubrication. Storage space for 400-foot reel and power cord. Model A20, \$137.50.

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Kodak



BEHIND the SCENES

Beware of Leica Polish—35mm films to get shorter—Automatics from Germany—Press cameras from Japan—The 35mm Pentina—8mm Pentaflex—Malik Reflex.

It sounds peculiar but a new black Japanese shoe polish has the Leitz people in quite a dither. The name of the shoe polish? "Leica." But Leitz people are worrying about more than the obvious and erroneous conclusion that Leitz is now in the shoe polish business. Will any Leica owner coming across the polish assume it's made for applying the spit and polish to a Leica camera?

Shorter film, longer weekends?

Ever cursed the 20- and 36-exposure rolls of the 35mm film because you've shot ten or so color shots, want to

get them processed but still have ten or more exposures to go? The European photographer can expect some help. There's a swing among German color film manufacturers to a shorter film called a "weekend roll." The new roll has 15 exposures instead of 20. Both Agfa and Adox have announced plans for it and there seems to be a good chance that the 20-exposure roll will be dropped completely in favor of the shorter film.

The new automatics

Nobody, but nobody who is a German 35mm leaf-shutter camera manufacturer will be left out of the automatic electric eye sweepstakes. Unfortunately, the multiplicity of camera names and different automatic shutter and photoelectric cell systems is going to cause a great deal of confusion.

Rather than classify the cameras by the camera manufacturer, it will be easier to classify them by the type of

shutter system they use. Here's the reason. All of the new German automatics will be using either Compur or Prontor shutter mechanisms. They will build their cameras around them. Therefore, the exposure system de-



Dacora-matic 4D—button focusing.

pends not on the camera manufacturer but on the shutter maker.

Without going through the ordeal of examining the innards of each system, here is how they differ basically:

Prontomat S: You set the exposure index and the photoelectric cell selects both shutter speed and lens aperture when the shutter release is pressed. Camera makers have a choice of 4 "programs." 1. As light increases the shutter speed increases from 1/30 to 1/300 with lens at f/2.8. As light increases further lens closes. 2. As light

When your

16mm opens the way. And all the means you need is the Cine-Kodak K-100 Turret Camera.

This versatile camera opens up new elbow room for your shooting scripts... gives you the chance to put your most inventive movie ideas on film.

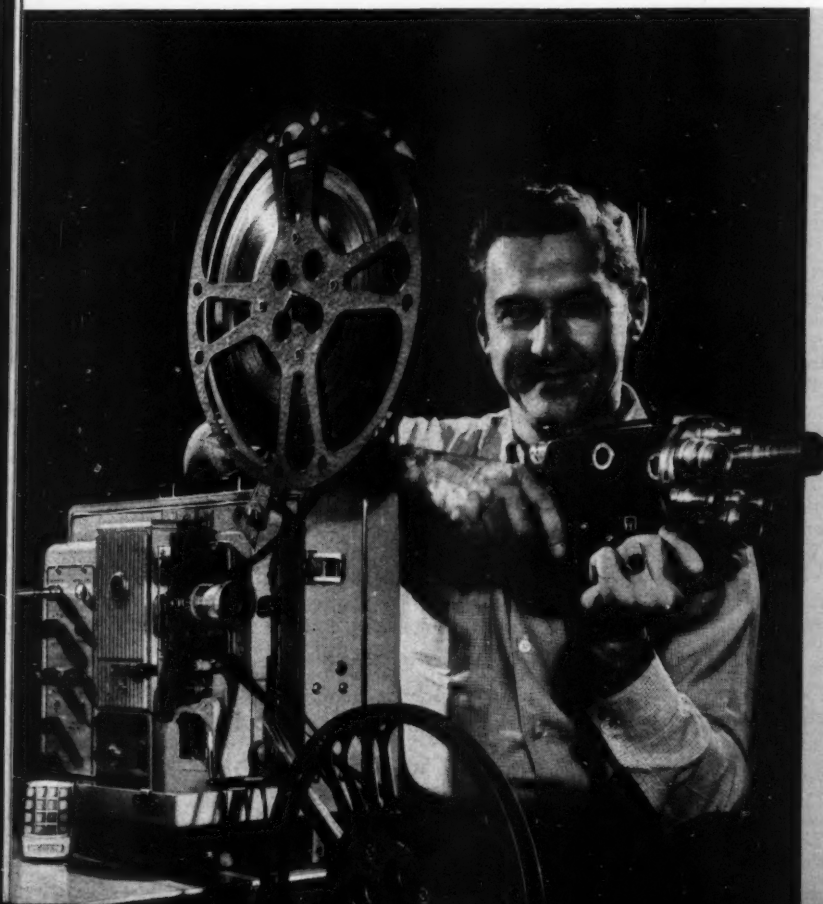
With it, you have the drive to capture imaginative, long-flowing sequences without a stop. For one winding gives you an amazing 40-foot film run.

And you have the means for creative pacing through quick cuts. The three-lens turret of the K-100 Camera lets you cut from normal to wide-angle to telephoto, as you like. A turn of the turret, and your lens—with its matching viewfinder—clicks into ready position.

The viewfinder clearly outlines your lens field plus a generous surrounding area, making it easy to follow action.

Full creative control. Optical effects to create mood also come easy. A single-frame exposure release lets you film time-lapse sequences and animation.

And with an auxiliary hand crank you can backwind for fades and dissolves.



increases the aperture closes but shutter remains at 1/30. After f/22, shutter speed increases to 1/300. 3. Exposure is selected from 450 possible increments from about f/2.8, 1/30 to f/22, 1/300. 4. As light increases, exposure is selected from 11 pairings of apertures and speeds. This seems to be most favored system.

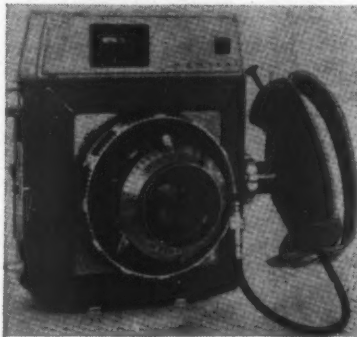
Prontor-Lux: This is more in the way of a shutter for beginners' cameras. When you set the exposure index, you also set the shutter speed. A 160 E.I. sets the camera to 1/500 sec., a 100 E.I. to 1/125, 25 E.I. to 1/60 and 10 E.I. to 1/30. The meter then selects the proper lens opening when you press the shutter release. The Agfa Optima I will be using this shutter as will the Dacora-matic 4D, which is a strange machine indeed (see photo). Not only is the exposure automatic but focusing is almost so. At the front of the camera are 4 buttons with symbols indicating "portrait," "figure," "group" or "landscape." Press the right button for the right subject matter and you're automatically in focus.

What about Compur shutters? At least two models of these are also on the way, probably much akin to the Prontor units. The first, the Compur Automatic, which allows you to select your own shutter speed, is already being used on the Argus Autronic and the Super Baldamatic.

All these shutters use tension from shutter release or film wind to operate exposure control. None have slow speeds under 1/30 sec.

New 2 1/4 x 3 1/4 press cameras

While we generally think of the Japanese photo industry as producing ultraminis and 35mm cameras in an almost unlimited variety, plus 2 1/4 x 2 1/4 cameras, bigger things are on the way. Just getting into production is the Mamiya Press 2 1/4 x 3 1/4 camera featuring an interchangeable four-element 90mm Mamiya Sekor f/3.5 lens in bayonet mount and Seikosha-S shutter with speeds from 1 to 1/500 sec. You focus the camera through a single-window combined range- and viewfinder which is auto-



2 1/4 x 3 1/4 Mamiya Press.

matically parallax corrected. Of course, there's ground-glass focusing as well. The range- viewfinder, it's claimed, is bright enough to be used even in poor light. The film plane can be swung outward 33mm, or 17 degrees. There's a detachable grip handle equipped with cable release and lock. A unique roll film holder is promised, as well as a 63mm f/6.3 wide-angle lens and a 150mm f/5.6 tele. There's a mask for this latter lens built right into the finder of the camera.

The second 2 1/4 x 3 1/4 press camera is the Topcon Horseman Press, which is somewhat higher in price (in Japan) than the moderate Mamiya Press. The Topcon has a four-element 105mm f/3.5 Mamiya Sekor lens in Seikosha shutter with speeds from 1 to 1/500 sec. There's a special "press focus" device which allows you to view the subject at full aperture and stop down automatically to the predetermined shooting aperture just before you shoot. The rangefinder shows a 1:1 life-size image and couples with the normal lens, a 65mm f/5.6, and a 180mm f/5.6 by a series of interchangeable rangefinder cams on the bed of the camera. The viewfinder has bright framelines parallax corrected for the normal and tele lenses. And there's ground-glass focusing too. The lens board swings in either direction up to 15 degrees, can be raised ver-

(Continued on page 18)

ideas ask for the moon—

You can match filming speed to mood and action. The Cine-Kodak K-100 Camera lets you do it precisely with speeds from 16 to 64 fps.

Next, you'll be ready for sound. But this remarkable camera is ready for it now. It handles film perforated along only one edge. So later you can add a full-width magnetic stripe to get superior sound.

Ask your dealer to show you the Cine-Kodak K-100 Turret Camera. It's yours with 25mm f/1.9 Ektar Lens for \$337. The three-lens turret accepts your choice of six Kodak Cine Ektar Lenses—15 to 152mm—in "C" mounts directly.

It's easy to add the dimension of sound. You do it with the Kodak Pageant Sound Projector, Magnetic-Optical, Model MK5.

With the MK5 you have virtually unlimited freedom in recording sound tracks right on your 16mm movies. You

can blend words, music, and special sound effects to tell a dramatic story, to increase the realism of your travelogues.

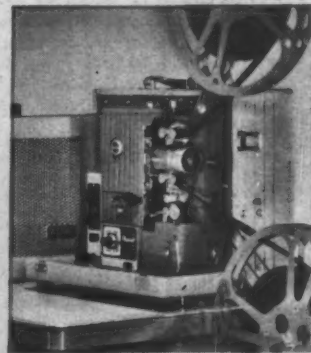
You simply have magnetic striping added to your old or new 16mm movies (Kodak Sonotrack Coating is available through dealers). Then you record your sound as the projector shows your film.

You can erase, re-record until you are satisfied. A special locking device prevents erasure during normal projection.

Bonus features: The MK5 Projector can also project commercially produced optical sound films; the amplifier can be used as a public-address system.

With 2-inch f/1.6 lens, 750-watt lamp, 10-watt amplifier, 2,000-foot film capacity, baffled 11-inch oval speaker, 40-foot speaker cord, microphone, lifetime lubrication—the Kodak Pageant Sound Projector, Magnetic-Optical, Model MK5, costs \$350.

Prices are list and subject to change without notice.



16mm sound movies on a budget

The Kodak Pageant Sound Projector, Model MK5, provides brilliant, detailed screenings with its 750-watt lamp and 2-inch f/1.6 Kodak Projection Ektanon Lens.

Powerful 8-watt amplifier and well-baffled 9-inch oval speaker, built into the lift-off cover, reproduce quality sound from optical sound tracks.

Permanently lubricated. Folding reel arms and threading diagram make setup quick, easy. Only \$429, complete.

The more you know about photography... the more you will count on Kodak

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★ PICTURE IT NOW—
See it again and again

Kodak
TRADE MARK

new Sankyo MOVIMAT

"sankyo quality"

ELECTRIC-EYE 3 LENS TURRET CAMERA

complete with 3 f/1.8 lenses
for only

\$89.50

The New Sankyo Movimat with built-in Electric-Eye is completely automatic! Electric-Eye works perfectly and automatically with all three f/1.8 lenses, the normal, telephoto and wide angle! No manual assistance is required. Just aim and shoot! No meter to set...no meter to read...no lens to set...Result...every picture perfect. And the Sankyo 3-lens turret Movimat gives you all these "plus" features:

- Easy-to-turn Turret complete with normal, telephoto and wide angle f/1.8 lenses.
- Visual signal in viewfinder tells when to shoot, or when under-exposed conditions exist.
- Viewfinder is coupled to lens turret movement for normal, telephoto and wide angle lenses.
- ASA 10, 16, 20, 32, 40; shutter angle 160 degrees.
- 8 foot continuous run on one winding.
- Easy drop-in film loading.
- Single frame exposure for titles and trick shots.
- Automatic footage counter.
- Pistol Grip coupled to shutter release, \$10. additional (optional).

See the new Sankyo Movimat 8mm Electric-Eye camera complete with 3 f/1.8 lenses for only \$89.50 list, at your camera dealer today. Write for Brochure.

Exclusive Sankyo Factory Representative
in the U.S.A.

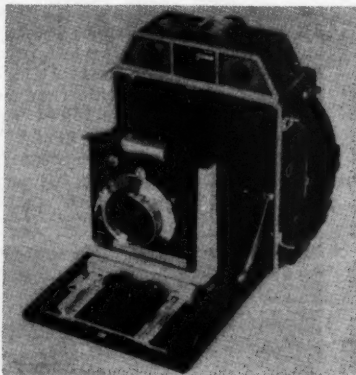
CAMERA SPECIALTY COMPANY, INC.
705 Bronx River Road, Bronxville, N. Y.

West Coast: **LACO PHOTO IMPORT CO.**
4018 W. Olympic Blvd., Los Angeles, Calif.

BEHIND THE SCENES

(Continued from page 17)

tically 2.5cm, and the film plane has an 11-degree vertical and 10-degree horizontal tilt. Roll holders, film pack adapters and the like are available.



2 1/4 x 3 1/4 Topcon Horseman.

Neither Mamiya Press nor the Topcon Horseman Press is available in the U.S. It's not been determined whether they ever will be.

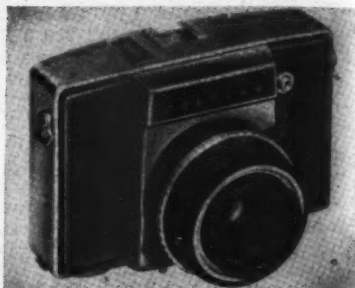
News from Leipzig

The spool vs. magazine-loading camera argument has been going on for years. Economy and accuracy vs. convenience sums it up in a nutshell. VEB Kamera-und-Kinowerke, Dresden, has dreamed up what might be the ideal compromise. The new Pentaflex 8 reflex with built-in and coupled exposure meter uses double-8 spool film which is first loaded into interchangeable daylight-loading cartridges. Have the problems of accurate travel through the film gate been solved? We'll have to wait until the camera appears here—if it does. Other features of the Pentaflex are interchangeable lenses of 5.5, 25, and 40mm, 8 to 64 fps.

16mm fans who have felt left out by all the attention given to 8mm through-the-lens focusing movie cameras will be happy to know that a 16mm Pentaflex is also planned.



8mm Pentaflex, 16 to come.

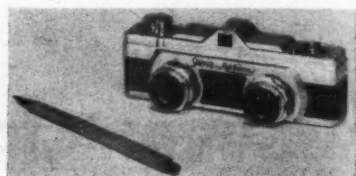


Pentina—35mm leaf-shutter reflex.

In the still camera field, a rapid wind lever attaching to the Praktina's base plate was announced at the recent Leipzig fair along with a set of automatic extension tubes allowing the Praktina automatic diaphragm to work for close-up shots.

Two interesting cameras made their appearance at the Leipzig fair. First there's the 35mm Pentina (from the Praktina stable of cameras). The Pentina appears to be a single-lens reflex with leaf shutter, fully interchangeable lenses including 30, 85 and 135mm. Normal lens is a 50mm Jena "T" f/2.8. Rapid wind lever is on the bottom of the camera, shutter release on left hand side. The prism bump on camera top is absent.

The first ultraminiature camera that we know of to blossom forth from two



Ultraminiature stereo Mikroma II.

dimensions into the third, is the Czechoslovakian Mikroma which showed up at Leipzig as the Mikroma II Stereo with matched 25mm f/3.5 lenses. The 16mm film is spooled, as it is for the regular Mikroma, in special cartridges. While all the above equipment—still and movie—was shown in working models, none is in production, and no one is indicating when it will be.

The French touch

C'est magnifique! From France comes news of a 35mm eye-level single-lens reflex with built-in zoom lens. After hearing rumors about the Malik Reflex we sent our Paris agents to talk with the inventor, Pierre Couffin. Yes, he has a 35mm eye-level reflex with focal-plane shutter in the works. It has a preset f/2.8 Zoomal lens going from 35 to 75mm. The camera and lens are no bigger, longer or heavier than an average 35mm camera with a normal lens. Shutter speeds, slightly on the abbreviated

(Continued on page 18)

Relax! SAWYER'S REMOTE CONTROL PROJECTOR DOES ALL THE WORK!



NOW—Focus, Reverse, Advance Slides by Pushbutton Remote Control

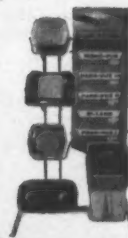
Just move a finger . . . advance slides, reverse and even focus from across the room. All the projector controls to run your show are right in your hand. Show 36 2x2 slides—any mount, any sequence—with never a jam, pop or skip.

And with Sawyer's patented Easy-Edit flip-top trays, you project slides full screen while arranging your show. Get your hands on a 500-watt Sawyer's at your dealer . . . the "500"R Full Remote Control, the "500"E pushbutton electric or one of the manual-automatics from as low as \$54.50, complete with slide-on carrying case.

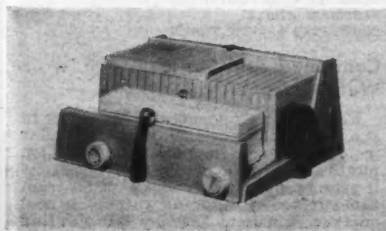
"500"R illustrated with full remote control, \$99.95 complete.

Quality performance from fingertip to screen

Sawyer's hand or table-top color slide viewers. Pick yours from this display at your photo dealer.
From \$1 to \$6.95



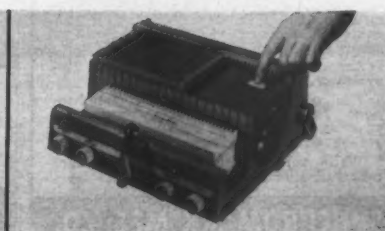
Portland, Oregon



NEW "500"5—biggest projector value on the market—manual-automatic, 500 Watts and only \$54.50.



"500"—Modern Sawyer's projector features, manual-automatic with deluxe appointments, \$69.95.



"500"E—automatic electric with Pushbutton control on the projector—forward or reverse, only \$79.95.

**For Sheer Dollar Value...
One Single-Lens Reflex Is Out In Front**



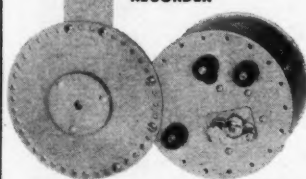
Oh that
MIRANDA'D'

Imagine a true luxury camera priced to fit the tightest budget... with incredibly sharp Miranda-Soligor f2.8 preset lens interchangeable with most other 35mm lenses; instant-return mirror; eye-level pentaprism viewing; synch. shutter to 1/500th second; rapid film advance and rewind and lots more! Plus quiet, vibration-free operation typical of Miranda quality. Ask your dealer to introduce you... see how much you get for a mere... **\$119.95!**

ALLIED IMPEX CORP., 300 FOURTH AVE., NEW YORK 10
CHICAGO 10 • DALLAS 7 • LOS ANGELES 36

AMATEUR-PROFESSIONAL-INDUSTRIAL SYNCHRONOUS SOUND

WITH YOUR PRESENT 8 MM.
OR 16 MM. PROJECTOR
AND ANY MAGNETIC TAPE
RECORDER



The Synchronmark SYNCHRAAPTER, illustrated above, is a low cost adapter which slips onto your present movie projector just like a reel of film and controls the speed of the projector to synchronize it with any standard magnetic tape recorder. You can readily add narration, background music, sound effects, etc., to your existing or future films. No magnetic stripping or other special treatment of the film is required, and you get the full fidelity sound of your tape recorder.

Accessories for obtaining perfect lip-synchronization also available.

The optional Synchronmark Synchronous Tape Editing System makes it possible to edit your film and tape together without loss of synchronization.

Write for free catalog giving prices and full specifications.

SYNCHROMARK MFG. CO.
P.O. Box 1113, Washington 13, D.C.

LET'S TALK ABOUT THIS PROBLEM OF EXPOSURE CONTROL IN MAKING ENLARGEMENTS

First, you need not one, but TWO answers. You must know the proper exposure (time vs. lens aperture); and you must know the proper paper contrast (or variable contrast filter) to fit the density range of the negative. One answer is as hard to guess as the other. Whether you spend \$15.00, \$18.50 or \$700.00, the photo-electric Spot-O-Matic II enlarging meter is the only device that gives BOTH answers automatically.

Second, you need phenomenal accuracy and sensitivity. A meter for spot readings in enlarging must be about 1000 times as sensitive as a meter used in ordinary picture taking—yet it must be at least four times as accurate! Only Spot-O-Matic II, with its exclusive variable area dial, with its super-sensitive photo cell and glow indicator, meets all the requirements of both accuracy and sensitivity. Completely photo-electric, not visual. You can't buy greater accuracy—you can't buy as much convenience—at any price!

Research has convinced us that the R.C.A. cadmium sulfide photo conductive cell employed in Spot-O-Matic provides the most accurate, stable, economical and trouble-free basis for such measurements. One inherent characteristic of all such cells is a slight time lag. The exclusive Spot-O-Matic diminishing signal, plus new instructions, show how to compensate for this and read both exposure and paper contrast in less than 15 seconds.



SPOT-O-MATIC II
PHOTO
ELECTRIC
Enlarging
Meter

FULL ONE-YEAR GUARANTEE

\$18.50
COMPLETE

100-130 volts AC-DC

200-240 Volt
Model Available

**KINNARD
CO.**
324 W. Vine Street
Milwaukee 12, Wis.

NEW products

Auto-Manual 35mm Camera

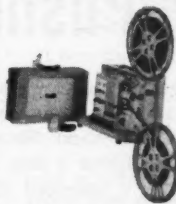


The Olympus Auto Eye 35mm Rangefinder camera, with 45mm f/2.8 D Zuiko lens, has fully automatic (electric eye) and manual operation. On automatic you set

the film speed (from E.I. 10 to 800), set the shutter speed, focus with either the rangefinder or zone system, and shoot. The exposure meter, coupled to the diaphragm, automatically opens or closes the lens. As you press the shutter release the f-number appears in the finder. If there is not enough light the release button locks and a curved red arrow appears, the curve indicating the direction in which to turn the shutter-speed dial to get the proper setting. In addition, there is a warning signal when the light level is below the level of the built-in exposure meter. The Auto Eye has a Copal SV shutter with speeds from 1 to 1/500 sec. B, MX sync, and self timer. Other features include: accessory booster for meter, single-stroke film advance, film advance and rewind indicator, frameline finder with automatic parallax compensation, and automatic flashbulb setting system. The Olympus Auto Eye sells for \$79.95; case, \$10. Write: SCOPUS, INC.

404 PARK AVE. SO., NEW YORK 16, N. Y.

Magnetic-Optical 16mm Projector



Kodak introduces a new model of the 16mm Sound Motion Picture Magnetic-Optical Projector. Known as Pageant Sound Projector, Magnetic-Optical, Model MK5, it records and plays back sound from magnetic tracks at either sound or silent speeds, in addition to optical sound reproduction. The volume controls permit mixing background music with narration at the proper levels. The MK5 has a larger (11 x 6-in.) speaker than earlier models. Other features are a tungsten-carbide film pulldown claw and a single switch control for the motor, lamp, and forward and reverse film movement. The Model MK5 16mm sound projector costs \$850. Write:

EASTMAN KODAK
ROCHESTER 4, NEW YORK

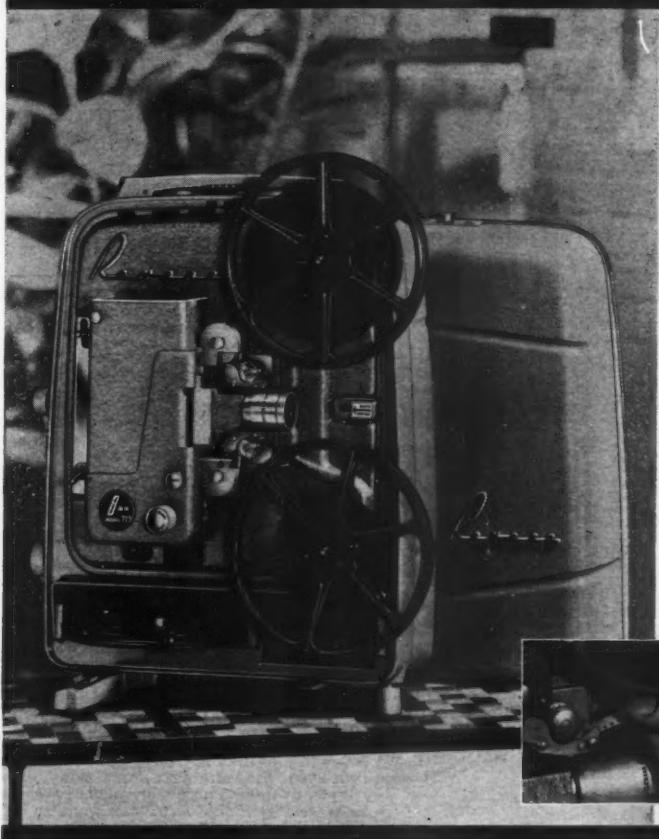
Combined Anti-Static Wetting Agent

Ecco #121 Concentrate is added to the final water rinse, like a regular wetting agent, in processing motion picture film. The manufacturer claims it promotes fast, even water runoff from film surface by reducing water's natural surface tension, thereby eliminating water spots and streaks and reducing drying time. Ecco #121 also provides an

(Continued on page 22)

NEW!

- NO THREADING!
- FULLY AUTOMATIC!
- F/1.5 ZOOM LENS!



Revere "AZ-777" 8MM AUTOMATIC MOVIE PROJECTOR

Automatically feeds film on to take-up reel . . . starts movie show by itself!

Definitely the ultimate in movie projectors! No more bother with complicated threading procedures . . . this splendid new Revere does it all for you! Just snap on movie reel, flick the switch, place film leader at sprocket-feed, and the show begins automatically. You'll get professional-type brilliance, sharp and alive movies with exacting detail.

The Revere "AZ-777" features newly designed super-fast Wollensak F/1.5 ZOOM lens that zooms pictures from ordinary lens size to almost twice as large . . . making it easier to accommodate picture to screen size without altering screen distance. FORWARD-REVERSE control; ultra-bright still picture; high speed rewind; 750 watt lamp, etc. With 400-ft. reel, cord and case, **\$147.50**



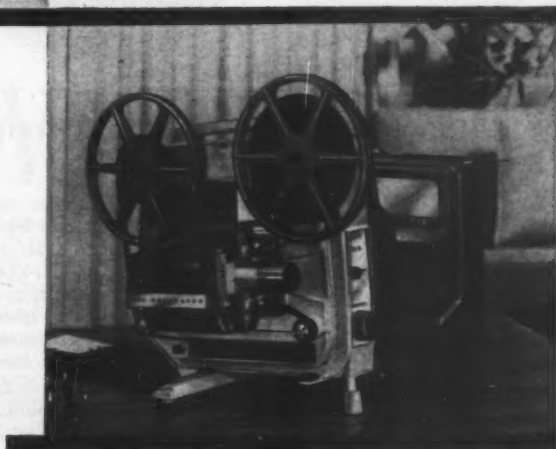
Automatic Load—Sprocket-feed takes film from fingers, passes it through gate and loop guides, and feeds it on to take-up reel automatically!

Zoom Lens—Makes it easier to accommodate picture to screen size without altering distance.

Revere "Z-718" 8MM MOVIE PROJECTOR

A top-quality, compact home movie projector. Completely streamlined, this new Revere features many advanced innovations. New super-fast Wollensak F/1.5 ZOOM lens that zooms pictures from ordinary lens size to almost twice as large . . . making it easier to accommodate picture to screen size without altering screen distance. No refocusing necessary after zooming. Latest type film retainers and swing-open gate for easy threading; rear control panel; new DCA reflector-type lamp; bright and super-bright illumination switch; single forward-reverse control; high-speed rewind; bright still picture, etc. With carrying case, cord and 400-ft. reel. **\$114.50**

P-718—Same with Wollensak $\frac{3}{4}$ " F/1.6 lens, **\$99.50**



DE LUXE POWER-ZOOM

Electric-Eye fully automatic cameras. The touch of a finger zooms lens and transports film simultaneously, with perfect exposure. Coupled zoom viewfinder; superfast f/1.8 Power-Zoom lens; Magazine or spool load. Manual exposure control optional. Prices from \$189.50.



POWER-ZOOM

Electric-Eye cameras with automatic Power-Zoom operation. Normal, wide-angle and telephoto scenes at the touch of a button. Coupled zoom viewfinder; superfast f/1.8 Power-Zoom lens. Magazine or spool load. Manual exposure control optional. Prices from \$174.50.



CINE ZOOM

Electric-Eye cameras with manual Zoom feature. Operator glides the superfast f/1.8 Raptor Zoom lens back and forth through zooming range, without stopping camera. Coupled zoom viewfinder; Magazine or spool load. Many other amazing features. Prices from \$144.50.



FEDERAL EXCISE TAX INCLUDED WHERE APPLICABLE

REVERE CAMERA COMPANY, CHICAGO 16 • LOS ANGELES 7

COORDINATED *photography* VOIGTLANDER BESSAMATIC 35mm

One look and you see everything—



*viewing... focus
... exposure*



widely capable reflex at new low price

You have Voigtlander's One-Look Photography at its best in Bessamatic, the most completely coordinated single lens reflex.

The right composition, the right focus, the right exposure are so simple, with no calculations, that really good pictures come easily for beginner or expert. For one shot or a fast sequence you need never look away from the big viewfinder.

You save the split seconds, catch the fleeting expression, the instant action that makes pictures great. Two-way focusing and diaphragm are automatic. No parallax error.

Bessamatic camera with famous 50mm Color-Skopar f/2.8 lens and Synchro-Compur 1/500 shutter, \$199.50. Bessamatic with new ultra-resolution Septon 7-element, 50mm f/2.0 lens, \$259.50.

The Bessamatic takes real interchangeable lenses:

Voigtlander-Zoomar wide-angle-to-telephoto lens, (36-82mm), \$298.

Voigtlander wide-angle lens, 35mm., \$79.50.

Voigtlander telephoto lens, 100 or 135mm, \$79.50

There are other Voigtlander 35mm models priced as low as \$39.50.

SINCE 1756

VOIGTLANDER

H. A. BOHM & COMPANY, SOLE AMERICAN IMPORTERS • 2814 W. PETERSON AVE., CHICAGO 45, ILL.

NEW PRODUCTS

(Continued from page 20)

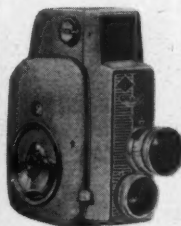
invisible, chemical anti-static treatment that prevents the attraction of dust to the film. One treatment is said to last for several months and the active ingredient is non-greasy and will not harm film emulsions. Filters, slide carriers and printing equipment can also be treated by wiping them with a soft cloth moistened with the rinse solution. Ecco #121 is diluted 1 oz. to 1 gal. of rinse solution, which remains effective as long as it is uncontaminated. It comes in 8-oz., pint, qt., and gal. plastic containers. Prices: \$1.30, \$2, \$3.50, and \$12.50. Write:

ELECTRO-CHEMICAL PRODUCTS CORP.
427 BLOOMFIELD AVE., MONTCLAIR, N. J.

IN NEXT MONTH'S MODERN

Look out for this jam-packed two-section issue—one section devoted to 2 1/4 photography, the other to movies.

Agfa Auto 8mm Camera

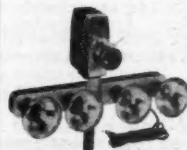


The Agfa Movex Automatic 8mm motion picture camera features an Agfa Kine Anastigmat Movestar 12mm f/1.9 lens, which focuses down to 7 1/2 in. An electric eye, which can be adjusted from E.I. 8 to 400, automatically sets the lens aperture, but can

also be locked out for manual operation. The Movex has a needle in the optical viewfinder that registers the lens aperture so the photographer can judge depth of field. The needle also serves as a warning indicator for too high or too low light levels. The viewfinder is coupled to the lens to correct for parallax down to 31 in. The camera uses standard 25-ft. double rolls, exposes about 6 ft. on one winding, has provision for single-frame exposure, and cable release sockets for motion and single-frame exposure. Accessory lenses available are the Agfa Curtar wide-angle with viewfinder attachment, and the Agfa Tele-Longar lens (knob on camera viewfinder reduces field of vision). The Agfa Movex Automatic is priced at \$99.50; fitted case, \$15; accessory lenses, \$39 each. Write:

AGFA, INC.
516 W. 34TH ST., NEW YORK 1, N. Y.

Light Bar Series



The Mini-Bar, 400 Series, is a group of one-piece, all-steel light bars. No. 400 MC is a two-switch unit which holds four BEP 300-watt or EBR 375-watt photo-flood lamps. It has an extra adapter plate that holds movie cameras with front shutter releases in back of the hot lamps. Model 400 MCX is a similar unit with an "Adjusto-Lite" bounce bracket. Both models are 16 in. long and have four heat resistant sockets, two switches each for two lamps, 6-ft. cord, padded camera rest, plastic handle and two cord-winding clips in

MODERN PHOTOGRAPHY

back for cord and plug when not in use. Both come with a 16 x 6 3/4 x 5-in. metal carrying case which holds bar and four lamps. Prices, without lamps: Model 400 MC, \$8.95, Model 400 MCX, \$10.95. Write:
 LOGAN ELECTRIC SPECIALTY MFG. CO.
 1431 W. HUBBARD ST., CHICAGO 22, ILL.

Electronic Flash for Close-ups



An electronic flash unit, called the Sun-Lite Sunring, is designed for use in detailed close-up photography on an around-the-lens installation. The ring-type light weighs 1 1/4 lbs., measures 5 x 4 1/2 x 2 3/4 in., and can be used with shoulder strap or on a surface (with rubber feet). Sync is either X or 0 delay, with 1/1300-sec. flash duration, 5-sec. recycling, 50-watt-second power rating, and 6500° Kelvin color temperature. Sunring fits Series VI and VII (with an adapter ring) lens mounts. It has a built-in ready-light, detachable 6-ft. line cord, and operates from any 110-volt, 60-cycle AC outlet. The Sun-Lite Sunring is priced at \$77.50. A power pack is available for \$34.95. Write:
 HERSHEY MANUFACTURING CO.
 4309 W. LAKE ST., CHICAGO 24, ILL.

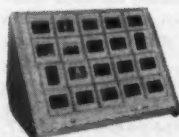
Sekonic Reflected Meter



The Sekonic L-86 Auto-Lumi Exposure Meter, designed for reflected light measurement only, features the Auto-Guide Indicator. In operation, as you turn the knurled calculator dial the Auto-Guide Indicator is aligned with the activated needle of the photoelectric cell. You read the proper exposure on the dial.

The L-86, said to have a specially ruggedized microammeter, is calibrated from ASA 10 to 12,000 (3 to 42 DIN), and LVS numbers 2 to 19. It has shutter speeds from 8 sec. to 1/2000 sec. and f-numbers 1 to 32. Figures on the calculator dial are in red and black. The Sekonic L-86, with case and neck cord, sells for \$6.95. Write:
 SEKONIC, INC.
 130 W. 42ND ST., NEW YORK 36, N. Y.

Multiple Slide Viewer



Up to 20 2 x 2 slides can be viewed at one time on the Model 502-2 Pictar Slide Editor. Featuring an Eastman plastic diffuser, the viewer uses a standard 40-watt, 110-volt AC household bulb as a light source. Color temperature is 4200° Kelvin, with the maximum temperature rise of 35° said to be safe for all color slides. The manufacturer claims even light diffusion to all corners with a 250 foot-lamberts average. A small extension on the four horizontal slide ledges holds all slides in place. The vertical side case design permits

(Continued on page 38)

SEPTEMBER, 1960

greater than ever **NEW** 35mm **VITOMATICS** by **VOIGTLANDER**

Magic Circle exposure pointer is in the viewer!

No Figuring! You View—
 Expose Automatically—
 In One Big Clear Look



NOW from JUST \$89⁵⁰

When you pick up a new Vitomatic, you'll know you've got hold of something really great. Take one look in the big brightline viewfinder, cover the coupled exposure meter pointer with the Magic Circle and you have the right exposure. Just focus and click! Pointer and Magic Circle are also visible on camera top.

Life-size viewfinder (one to one viewing ratio) permits viewing with both eyes open, even with glasses.

Enjoy all this: Renowned Color Skopar f2/8 lens, 4-element, coated, anastigmatic, specially ground for

color. New, Prontor SLK-V shutter, to 1/500 second and B. Built-in timer —take self-portraits! Full flash synchronization, cable socket, accessory shoe. "Natural" under-your-finger release cuts blurring camera movement —especially valuable for action shots. Single-stroke film advance cocks shutter, counts, prevents double exposure. And there's much more! Take one look at the new Vitomatic at your dealer's. Your hands will sense high level precision. Tremendous values in traditional Voigtlander craftsmanship! Vitomatic 1a—\$89.50.

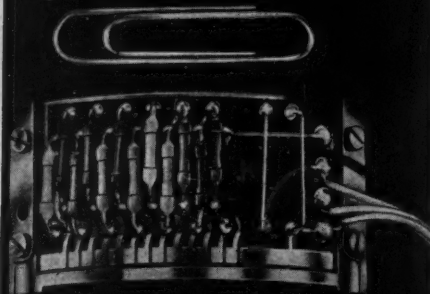
Vitomatic IIa same as above but with added feature: razor-sharp rangefinder together with Magic Circle exposure pointer, both in the big brightline ONE LOOK viewfinder \$109.50

VOIGTLANDER

SINCE 1756

H. A. BOHM & COMPANY, SOLE AMERICAN IMPORTERS • 2814 W. PETERSON AVE., CHICAGO 45, ILL.

EXCLUSIVE!



only the automatic
FUJICA 35
 has 13 electrical resistors
 in its coupled
 light meter system.

One of the reasons for the consistently accurate exposures found in pictures taken with a **FUJICA** is its unusual light meter system. Instead of having gears or cams that might be affected by temperature or physical shock, there are 13 electrical resistors. These control the infinitely small electrical impulses generated by light that hits the photo cell. They are part of the controlled automation circuitry that enables you to "just center the needle and shoot" . . . or for unusual light or action situations, select any one of a complete range of aperture and shutter-speed combinations automatically pre-set for you.

In addition, **FUJICA's** natural thumb position rear focusing enables you to shift and pinpoint your focus quickly and smoothly from closeup to middle shot to infinity without finger fumbling.

With 10 different shutter speeds up to 1/500th and the superb Fujinon lens, there is no limit to your range of superior color or black and white pictures.

It will be worth your while to visit your camera store and compare a **FUJICA** with "35s" selling for about \$100 more.

NEW LOW PRICES

FUJICA with f/2.8 lens and built-in automatic meter. **\$89⁹⁵**

Other fine **FUJICA's** from \$59⁹⁵



FREE: 40-Page **FUJICA FACT BOOK** packed full of useful data on 35mm Photography, at your favorite camera store or write for your copy today.

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 In Canada: Precision Cameras of Canada Ltd.
 5385 Pare Street, Montreal 9, P.Q.

NEW BOOKS

(Continued from page 15)

tographed London life from the inside.

"I used a very small camera," he writes, "little apparatus, and no artificial lighting at all, because this seems to me the only way a photographer can hope to keep himself out of the scene." The amazing variety of places that he went to thus equipped includes East End pubs, West End clubs, a Salvation Army meeting, a brewery, a fire station, all kinds of stores and markets, parks, a graveyard, a Thames barge, and a ladies' Turkish Bath.

The pictures are arranged so that faces, attitudes and occupations are compared or contrasted, sometimes starkly (an East End garage hand and a Rolls-Royce salesman), sometimes with humor (a startled Macmillan appears to look at a music-hall nude and a wrestling match). But there is no overemphasis on such groupings: nearly every picture can be enjoyed for its own sake.

The only drawback of this book is the reproduction, which accentuates the grayness inherent in available-light pictures. Also, since the book was printed in England, some of the captions are too laconic for most Americans, who cannot be expected to know that "Putney to Mortlake" is the course of the Oxford-Cambridge Boat Race, or that Croydon Airport, once London's busiest, was recently closed.

The blurb on the jacket implies that this book makes one from now on see London as Tony Armstrong Jones does. It achieves something better: it makes one appreciate a different and exciting vision while preserving one's own.

—W.H.J.

PARIS, text by John Russell, photographs by Brassai, 264 pages. The Viking Press. \$5*

Primarily a text book, *Paris* is illustrated by 43 full-page documentary photographs of Parisian streets, buildings, and inhabitants taken by the well-known French photographer Brassai. The pictures (we wish there were more of them) capture the flavor and spirit of the city and the information contained in the text is of a considerably higher—and more sophisticated—caliber than that found in most travel-guide books. Highly recommended.—P.C.

PORTRAIT OF A GREAT COUNTRY—BRAZIL, Edited by Stefan Geyerhahn, text by Ellen Bromfield Geld. 169 pages, many illustrations in black-and-white and color. Viking Press, Inc. \$10.00*

This book shows some of the great contrasts of Brazil—from palm-swept beaches to Amazon forests, from imported Germanic to stocky Indian people, from bursting modern cities to huge ranches and diamond-rich rivers. Thirteen photographers contributed to this picture illustration. The quality of

their photographs varies greatly, from mundane to exciting. The editors obviously did not have a central theme in mind, as is implied by the title "Portrait of a Great Country." The photographs are reproduced well, however, with one to each page. The text, by Ellen Bromfield Geld, does describe this amazing country with enthusiasm and gives good background information for a better understanding of the photographs.—L.H.

DINGHY DAYS, by Eileen Ramsay. 142 pages, 67 illustrations. John De Graff, Inc. \$7.50

Dinghy owners will be interested in these full-page illustrations of English (plus a few American and Continental) boats under sail in various weather conditions. The photographs are well-reproduced on heavy art paper and include many action shots taken during races on English rivers. Morris Rosenfeld contributed eight sparkling photographs of American-type dinghies to the collection.—L.H.

THE ABC'S OF CAMERA REPAIR, by Samuel L. Love. 84 pages. National Camera Repair School, \$3.95*

Here's a really excellent glossary of photographic terms, from A to Z. It's a mystery, however, how the book ever got its title: it has nothing to do with camera repair other than having been published by a camera repair school.

—H.K.

VENICE, text by Anthony Thorne, photographs by Kurt Otto-Wasow. 66 pages, including 24 full-page color photos. Viking Press, \$5.95*

A book of this size obviously gives no more than a few glimpses into a city as richly picturesque as Venice. The color photographs, which are well reproduced, begin with St. Mark's Square and move outward, becoming more haphazard the farther they roam. A couple of incredibly dull general views are more than offset by several excellent photos of lesser-known corners of the city, whose pastel facades, subtly colored shadows and reflections are finely captured.

The captions are informative, but refer irritatingly to buildings and objects that cannot be seen in the accompanying pictures. The text, though it tends to the effusiveness that seems inseparable from such books, is also informative, and makes several perceptive comments on the pleasurable sights, sounds and smells of Venice.

—W.H.J.

These and other books are available through **AMPHOTO**; see pages 136 & 137.



MODERN PHOTOGRAPHY

COFFEE BREAK

(Continued from page 6)

cabin, you gaze at a large TV set which shows you the small town as you bank, and finally the runway. How's it done? All in miniature. A tiny town is built, and the plane, in the form of a very short focal-length lens complete with all sorts of zooms, swoops over the town and down to the runway, we hope.

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ANTI-SOCIAL CLIMBER? . . .

In our "Well Traveled Camera" this month, on London (see page 26), we state that there are few accessible vantage points in London where you can shoot processions, etc., above the heads of the crowd. After writing this, we happened to read an issue of the British *Amateur Photographer* in which one Derek Powell touches on this very question.

Mr. Powell agrees with us that there are few high vantage points, but this does not deter him—he creates his own. To shoot one procession he carried along a home-made stool. As this was rather cumbersome, he tried scrambling to the top of a street telephone booth, which was much more successful. But his most ingenious device was for a procession that passed Hyde Park—he put a hammer and some steel nails in his coat pocket, and when the time came he slammed some footholds into a tree.—THE END

FRENCH MOVIE

(Continued from page 13)

mind: We see the woman-as-a-girl bicycling gaily to a rendezvous through an autumnal French forest; then back to the low-lit Hiroshima cafe. We see her hysterical after the German's death; again back to the cafe. Not till very much later do we see the man's death—yet this disruption of time never causes confusion or breaks the movie's rhythm.

Resnais goes further still, chops the pieces even finer, in his mixing of past and present. When the Frenchwoman has left the cafe, torn by newly awakened memories, she walks endlessly through the empty streets. Resnais transforms her walk into a long series of dolly shots, alternately in neon-lit, rebuilt Hiroshima and amid the old stones of Nevers. (Though taken by different crews and separated by thousands of

(Continued on page 40)

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THE WELL TRAVELED CAMERA

by the editors

Touring England with a camera, Part I: What to see and shoot when you're in London.

Whether you're planning to be in London only long enough to peek at the Changing of the Guard, the Tower and the National Gallery, or will have time to explore its lesser-known features, you'll find that a widish-angle lens is the handiest for all-around use. With certain exceptions, noted below, London is not a city of wide vistas: streets tend to curve, many fine buildings are tucked away in corners, and often it's impossible to back up to a good vantage point for even a normal lens. And as far as displays of pageantry are concerned, you cannot rely on finding accessible vantage points above street level—you may have to hold your camera above your head to dodge the crowds.

Despite all the legends—which are supported by the English more than anyone else—the London summer can be very fine, the most reliable month being September. So there's no need to take faster films than you'd use elsewhere, or to make a special point of buying a red or haze filter!

Don't be afraid to take color film, and not just for the pageantry, either. I don't know whether it's the ever-present reds of those double-decker buses and the phone booths, or the orange of the Belisha beacons, or the rich green of grass and foliage in the parks and squares, but you'll find plenty of scenes in London that ask to be shot in color.

It is, of course, easy to buy all kinds of film in London. Just be warned that it carries a heavy tax.

Taking the long view

Now let's consider where and what to shoot in London after you've seen the most famous sights. Let's begin with the exceptions mentioned above—the spacious views. The top of St. Paul's is an obvious vantage point, but it won't give you very distinctive pictures. The top of the Monument is better, as it is closer to the Thames and Tower Bridge. Better still is the top of Westminster Cathedral (not the Abbey), which offers views over Buckingham Palace and its neighboring parks. But on the whole, London is best seen (and shot) from ground level.

The banks and bridges of the Thames give a great variety of long views—the most striking, perhaps, is from Hungerford footbridge (by Charing Cross Station), with the clean lines of Waterloo Bridge in the foreground and, beyond it, Somerset House and St. Paul's standing out of a mass of buildings that, from here, look predominantly white. East of London Bridge, you have the darker charms of dockland. "The Prospect of Whitby," a colorful pub in Wapping, offers a balcony where you can look right over a busy reach of the Thames.

Apart from Trafalgar Square, the main wide-open spaces in London are the parks. In St. James's Park it is possible to take a picture that includes rural trees and water, pelicans and flamingoes, and the classic lines of the government buildings in Whitehall. (Turn the other way, and you have Buckingham Palace.)

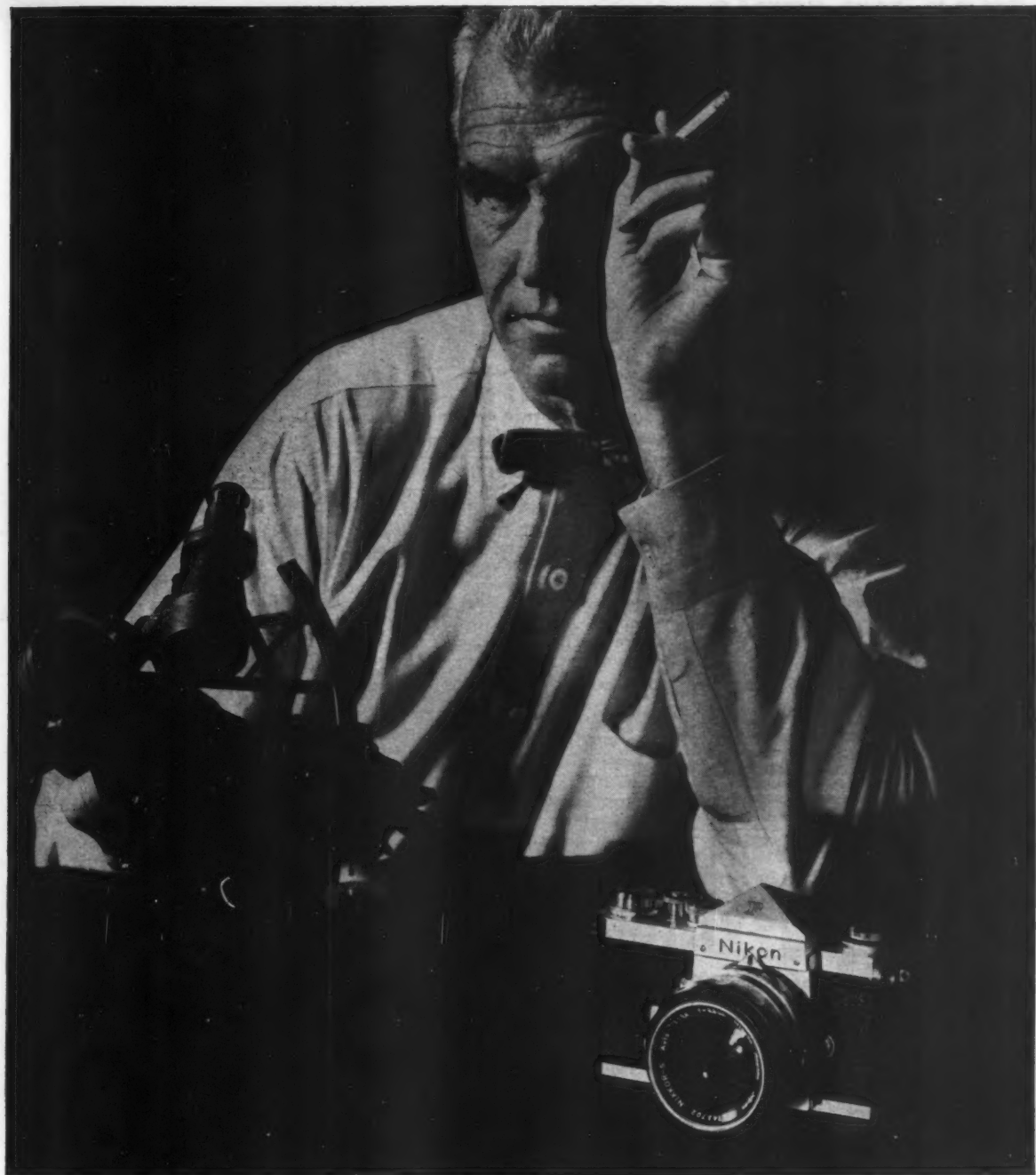
From places to people

In the Victoria Embankment Gardens, and also in Heath St., Hampstead, there are open-air art exhibitions in the summer. The art itself does not compare for quality with what you can see in the National or Tate Galleries, but the setting, the artists and the spectators make good photographic fare. For similar reasons, don't miss the open-air orators at the Marble Arch corner of Hyde Park.

In fact, don't overlook the people anywhere on your sightseeing. It's the people who make more than half the spectacle of, say, the Petticoat Lane market (its real name is Middlesex St.) or Soho. Watch out for the sidewalk (i.e. pavement) artists with their glorious Technicolor landscapes and portraits done in chalk. Watch out too for the buskers—the itinerant entertainers who sing, dance, tumble or even declaim Shakespeare to theater lines. If it's crowds you're after, try Oxford St. around 5:30 P.M., or—somewhat offbeat—the greyhound racing at White City, a football match at Arsenal (after August—check the papers to make sure the Arsenal team is playing at home), or look at Trafalgar Square on a Sunday afternoon to see if a political meeting is going on.

If it's quietude you're after, turn off into side streets and alleys—especially in the City proper, which is an excellent district for exploring on foot.

(Continued on page 28)



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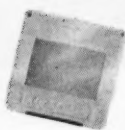
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BEHIND THE SCENES

(Continued from page 18)

side, range from 1/30 to 1/500 sec. There are rapid wind and rewind levers and also of course, a few flies



Malik—mirage or camera?

in the French ointment. Although six cameras are claimed to have been made, an ardent search by our agents failed to turn up any of them. The picture of the camera is an excellent example of French retouching and air-brush work. Production? By the time you are reading this, Malik should be flowing from the production line like champagne. At the price of \$200 for camera and lens, it's a bargain even if the camera is never made.—H.K.

TRAVEL

(Continued from page 26)

Even during the rush hour, you have only to pass through an archway off Bishopsgate St. to find yourself in the oasis-like churchyard of St. Ethelburgh, one of London's smallest churches. Even a cathedral—Southwark—is half-hidden by a rumbling railroad viaduct.

Here's where that wide-angle lens will really prove its usefulness, especially if you'd like to include some of the odder street names in your pictures. Roam around St. Paul's and you'll find Paternoster Row and Amen Court; around the Bank of England, Threadneedle St. and Austin Friars; in the eastern City, Crutched Friars, Houndsditch and Catherine Wheel Alley; across the Thames from the Tower, Pickle Herring St. And these are only a small sample.

The side streets are rewarding elsewhere in London, too—after all, you'll see little of Soho, the Inns of Court, Covent Garden, etc. if you stick to the main streets. London is the most haphazard of cities, with many features of interest scattered in unlikely places, so have your camera ready at all times for the unexpected. Who knows, you may be fascinated by such unsung London views as the tranquil Grand Union Canal in the wasteland behind King's Cross, the odd little churches in Upper Thames St., the Bunyan Memorial in Bunhill Fields, or the fairy-tale castle called St. Pancras Station.—W.H.J.

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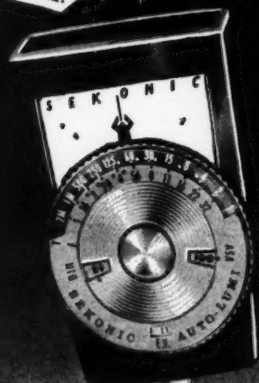
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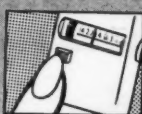
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the MOVIE MAKER

by MYRON A. MATZKIN

Here are some quick answers to sticky focusing and framing problems when shooting close-ups.



The close-up is the most effective shot in motion pictures—amateur or professional. But it's the one shot that amateurs have the most trouble with. Unless you own a through-

the-lens focusing and viewing camera, you've probably had the experience of seeing a perfectly framed shot in your viewfinder, and later finding a beheaded version projected on your screen. To add to your misfortunes, the shot may also be out of focus.

The problem arises simply because the separate finder and the lens don't see quite the same thing. This parallax error won't have any effect on your footage when you shoot at a camera-to-subject distance greater than six feet. It does become significant once you move in closer—to 3 or 4 ft. from the subject. While many cameras have parallax correction marks inside the finder, they can't always be depended upon for all close shooting. Usually they are set for one distance—3 1/2 or 5 ft., for example.

There are several quick solutions to this problem. In any case, the cure isn't involved enough to slow up or complicate your shooting. Let's look at five things you can do about correcting for parallax error.

1. Use a close-up viewing attachment: The Elgeet Cine-Flex, for example, fits right onto the front of your lens. It shows the exact field of view for wide-angle, normal and tele lenses and comes in both 8 and 16mm models. Also, if supplementary close-up lenses are used to get the framing you want, the Cine-Flex has provision for positioning them correctly in relation to the regular lens.

2. Mount your camera on a lightweight titler: Small titlers, such as the Bolex unit, or even smaller ones such as the Accura, are ideal for taking along on field shooting trips. With the camera aligned according to instructions, the

(Continued on page 32)

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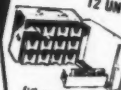
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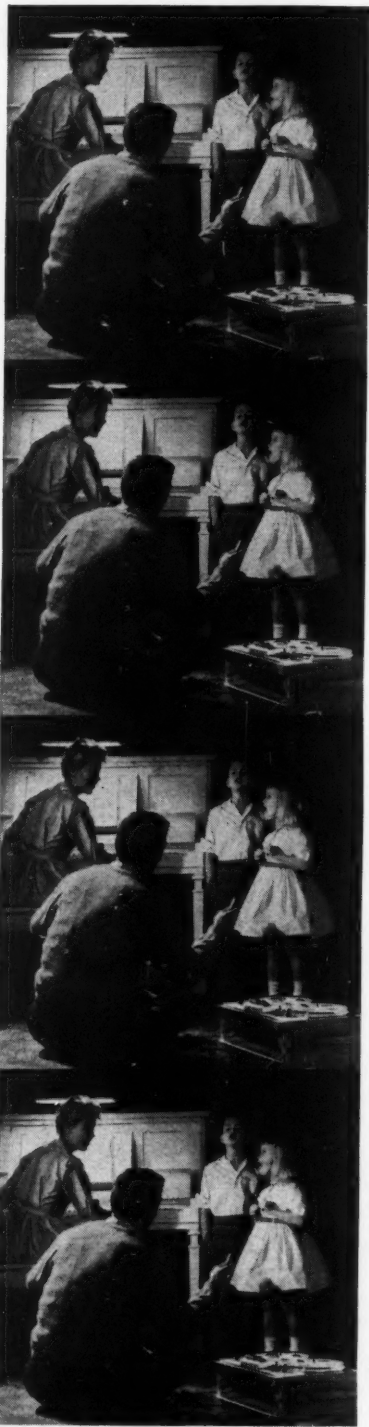
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Uniform tape... Uniform recording

GETTING THE SOUND YOU WANT from your recordings depends greatly on the tape you use. For consistently high quality recording, you need a tape with unquestioned uniformity... namely, "SCOTCH" BRAND Magnetic Tape.

UNIFORMITY MEANS constant thickness in tape backing and oxide coating. If these thicknesses vary, sound quality will vary, too.

TOO THICK an oxide coating, of course, will play up low frequencies. Too thin a coating will lose them.

DYNAMIC RANGE is identical throughout each reel of "SCOTCH" BRAND Tape and from one reel to another. That's because 3M makes sure these tapes are held to microscopic tolerances of backing and oxide thickness. In other words, performance is always exact with "SCOTCH" BRAND.

PROFESSIONAL BROADCASTERS have long recognized this uniform quality and have made "SCOTCH" BRAND Tapes the standard of the broadcast industry.

SILICONE LUBRICATION, an exclusive "SCOTCH" BRAND Tape feature, is another reason these tapes are preferred by people who really care about quality recording.

RESEARCH AND EXPERIENCE by 3M are responsible. This is the company that pioneered in magnetic tapes, the only company able to make a commercially practical video tape.

YOUR RECORDING requires the best tape... all the time. That's why it pays to play the favorite...

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MINNESOTA MINING AND MANUFACTURING COMPANY
...WHERE RESEARCH IS THE KEY TO TOMORROW



MOVIE MAKER

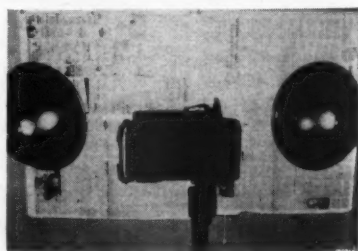
(Continued from page 30)

titler frame acts as a perfect outline of the area covered by the normal lens.

3. Make a plumb line to align the lens: This will work if the camera is mounted on a tripod and aimed straight down. Take a lens cap that fits your lens and drill a small hole in the exact center. Attach a surveyor's plumb line to the cap by passing the cord through the hole and knotting one end. Now, consult your camera instruction book or the *Kodak Movie Photoguide* book for the height the lens must be to cover the area of the desired image. After the tripod elevator has been raised to match the camera-to-subject distance, place the lens cap on the lens. Move the tripod until the plumb points steadily at the center of the area to be filmed. A ready-made plumb line device called the Accura Proxi-Centre—primarily intended for still cameras—is available for lenses using Series V filters, the size of many normal lenses on 16mm cameras.

4. Use an elevator tripod: You can use the elevator feature on a tripod to correct for parallax error if the finder is located directly over the lens, and the camera is mounted in normal picture-taking position. Measure the distance between the center of the finder and the center of the lens. Now frame the shot through the finder. Finally, raise the tripod the same distance as measured from lens to finder. This places the lens in the position formerly occupied by the finder, thus centering it on the subject.

5. Make a Polaroid chart: If you own a Polaroid Land camera, it can be used to check the amount of adjustment required to compensate for the difference between what the finder shows and a normal focal-length lens actually takes, which becomes important at distances of less than 6 ft. At the same time, the prints can be made into a handy reference chart for specific shooting distances. First we will discuss how to do this checking with only the non-parallax corrected viewfinder or ignoring the parallax lines.

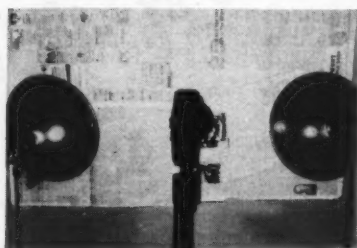


a. First, shoot a Polaroid Land camera photo of a few sheets of newspaper mounted on a wall.

b. Then look through movie finder at newspaper, from the same angle. If you are using a close-up attachment, you can find correct focusing distance from movie camera to newspaper in the fol-

lowing manner. Set lens at infinity. Each close-up attachment has a different focusing distance depending on its strength. The correct focusing distance in inches for any close-up attachment is found by dividing its diopter (strength), always given as a number, into 40. Thus, if a +2 attachment were mounted on the regular camera lens, 2 is divided into 40 for a focusing distance of 20 in. between close-up attachment and subject. Make a note of the focusing distance for this particular close-up attachment.

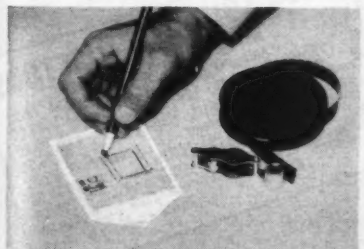
If using the lens alone or lens with extension tubes, measure from film plane. (On many cameras, you will find a film plane mark—an "O" with a line drawn through it on the side.) Write down this distance. Incidentally, use a steel tape measure, as the cloth variety may stretch.



Now that you have the correct camera-to-subject distance, look through the viewfinder at the field of view as shown by headlines, type, and illustrations on the newspapers. Outline this field of view on Polaroid picture you have taken. Then shoot actual movie footage of this field of view.



c. When footage is returned from processor, either inspect it with magnifying glass or project it on a screen.



d. Then outline this field of view on the Polaroid print you shot previously. You now have two frames that overlap. One frame shows what you saw in finder, and the other what was recorded on film.

(Continued on page 46)

INTRODUCING A NEW COMPANION TO FAMOUS EXAKTA...THE NEW

EXA II

lenses and accessories are interchangeable with both cameras



The Exa II is the newest precision single lens reflex creation from Germany! It reflects brilliant Exakta ingenuity and a smart new design... a milestone in Exakta's continuing progress and truly the most sensational development of the year!

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The Exa II camera with built-in eye-level prism viewfinder

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Leather Case	9.95

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In Canada: EXAKTA CAMERA COMPANY, 579 Richmond St., West, Toronto, Ontario

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AUTO-CARENA

The Auto-Carena is the world's finest 8mm fully automatic Electric-Eye motion picture camera

8MM CONVENIENCE—16MM QUALITY

You'll be delighted with this fully automatic 8mm motion picture camera that gives consistent 16mm quality roll after roll, the whole roll through. The Carena's electric-eye cannot make mistakes—sets the lens for correct exposure by itself to every lighting condition, positively, instantly, automatically.

Here is why Auto-Carena performs so magnificently, and has no equal in quality and performance!

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- AUTO-CARENA is manufactured to most exacting tolerances, rendering sharpness and brilliance obtainable only in 16mm cameras.
- AUTO-CARENA's Steinheil Culminon F1.9, 6-element lens was developed by 150 year old Steinheil Optical Works in Munich, Germany, after long research. Provides unmatched color quality. Steinheil Telephoto and Wide Angle lenses are also available.
- AUTO-CARENA cameras are supplied by Carena, S.A., Geneva, Switzerland. It goes without saying that this means famous Swiss Craftsmanship—the best!
- AUTO-CARENA design is the ultimate in styling. Engineered with imagination, it offers an 8mm camera with the quality of a 16mm camera. There is nothing that can be compared with it today.
- AUTO-CARENA lens aperture settings are seen in viewfinder as they are changed by fully automatic photo electric control. You always know the aperture at which pictures are being taken. And many, many more wonderful features as... Five speeds, 1, 8, 16, 24 and 32 frames per second... Continuous run... 7 ft. on one winding... From 10 ASA to 400 ASA... Easy drop-in film loading... Sure-grip handle houses the spring motor drive. To wind motor, just turn handle.

AUTO-CARENA Fully Automatic 8mm Electric-Eye Motion Picture Camera with F1.9 Steinheil Culminon lens	\$149.50
Steinheil-Carena Telephoto lens	29.50
Steinheil-Carena Wide Angle lens	29.50
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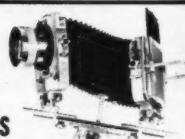
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..... \$116.00

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Super Konta C, Tess. 3.5, Rdr.	used	45.00
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5 1/4" Graflex Optar F4.7, Graphex synch.	used	27.50
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90mm Raptar F4.8, W.A. Rapax synch.	used	39.50
90mm Angulon F4.8 W.A. Compur	used	39.50
120mm Angulon F4.8 W.A. Compur	used	85.00
150mm Steinheil, F4.5, Compound, synch.	NEW	85.00
16" Wollensak F4.5, Telephoto	used	54.00
15" Wollensak F4.6 Telephoto	used	54.00
20" Zeiss Jena Reflex F4.5, synch.	used	39.50
30" Zeiss F4.3 lens	used	39.50
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2 1/4x3 1/4 Graflex B, F4.5	used	24.50
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Auto Rolleiflex, Tessar 3.5, Compur	used	35.50
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Auto Rolleiflex "T" LVS	used	128.50
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Kaloflex, F3.5, synch, reg.	899.00	12.50
Kodak Reflex, F3.5 synch.	used	12.50
Kwiflex, F3.5, synch, auto, reg.	99.50	32.00
Ikonflex Ila, Tess. 3.5 auto	used	66.50
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Yashica "A", F3.5, MX autom.	used	27.50
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28mm Angenieux F3.5 W.A., reg.	120.00	57.50
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35mm Steinheil Culmivar W.A., reg.	34.50	24.50
35mm Auto-Travaglin F2.8 W.A., reg.	99.50	49.50
35mm Auto-Tessar F2.8, reg.	69.50	11.50
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300mm Takumar F4, reg.	279.50	118.00
300mm Zeiss Sonnar, olympic, reg.	95.00	58.00
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Voliglander Zoom lens F2.8, reg.	318.50	184.00

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35mm Zeiss Biotar F2.8 W.A., reg.	149.50	49.50
35mm Zeiss Biotar F1.8 W.A., reg.	149.50	49.50
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105mm Nikkor F2.5, for Contax	NEW	79.75
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135mm Nikkor F3.5 telephoto, for Contax	NEW	67.50
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B&H Auto-Master, Turret, Mag. F1.9	used	32.00
B&H 2005F, F1.9, Electric Eye, Mag.	used	114.00
Cine Special II, F1.9, 100' Mag.	used	37.00
Kodak Royal, Mag. 16, F1.9, reg.	199.00	48.00
Kodak K100, F1.9, reg.	828.00	188.00
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Keystone K160, 750W proj., reg.	179.50	69.50
Ampro Premier 30, sound projector	used	129.50
B&H Utility, sound proj. 12" speaker	used	139.00
B&H 202, optical magnetic sound	used	338.00
Kodak Pageant sound, reg.	425.00	148.00
Ampro Compact sound projector	used	99.50
Revere SP16, sound projector, reg.	325.00	116.00
Victor 40, sound proj. 12" speaker	used	55.00

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B&H 1347A, Turret, F1.9, reg.	169.95	48.00
B&H 172B, Mag. 8, F2.5	NEW	24.50
B&H 300, Electric Eye, F1.9, reg.	69.50	46.00
B&H 309E, Electric Eye, reg.	139.50	69.50
Camex Reflex F1.9, reg.	199.50	99.00
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Revere 50, F2.8, roll, reg.	49.50	14.95
Revere 50, Turret, F1.9, reg.	137.50	38.50
Revere CA-1, Electric Eye, F1.8, reg.	139.50	58.00
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Revere 40, Mag. F2.5	NEW	14.50
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Wittnauer Cine-Twin, camera & proj.	used	79.50
Wollensak 53, 3 lenses, reg.	169.50	49.50
Wollensak 23, Turret, Mag. 3 lenses	NEW	52.50
B&H Monterey, 500W, reg.	79.50	79.50
Revere 83D, 550W proj., reg.	127.50	44.50
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1" B&L F2.7 lens, reg.	59.00	4.50
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35MM

by JOHN WOLBARST

**Shooting pictures on or of boats?
Here are a few ideas to help get
improved results.**

Boats and cameras are a natural combination, and of all cameras the 35 is one of the most desirable for this type of photography.

This is one area in which the full range of lens interchangeability can be used without a great deal of strain and struggle. Except for some very unusual situations, boating pictures are shot from a boat, or a dock or float, or some other relatively fixed spot where equipment can be kept at hand.

For pictures aboard the boat, I've found a semi-wide-angle lens (35-40mm) to be most useful. Small boats are just that—small—and a wider than normal field of view helps when snapping the crowd in the cockpit or lying around on the decks.

Also, such lenses get more into focus at any given setting than do lenses of longer focal length. This is particularly beneficial on sailboats. Very striking shots can be made in which you have in sharp focus the whole of a boom or the bowsprit, or some of the rigging.

When you want to snap another boat it's quite a different story. In most cases a wide-angle lens would be unsuitable. However, there are problems in using lenses of long focal length on and over the water.

If you can stand on shore, or on a solid dock or float, the very long focal-length lenses will bring you up close to boats which would be far beyond the reach of a normal lens. But sometime try to stand up in a moving, fast rocking and pitching small boat and try to aim a 200 or 300mm lens at another boat which is maneuvering rapidly.

The long lens magnifies the image, and it also magnifies every bit of motion. Very high shutter speeds are necessary in order to get sharp images. Right away this affects your film choice, and the final result. Remember that the most exciting boating pictures occur when there is plenty of wind and wave, and your own camera platform will be bobbing wildly, too.

Don't be under the impression that a simple, fixed lens camera should be left at home. Not at all. The long lenses are almost a necessity if you're trying to do a big job on a race, as you must be careful to stay off the course. But for just snapping away at your friend's boat, or strangers who pass by, you can come close enough to use a normal lens for excellent results.

Small boats rarely look their best when shot from either dead ahead or astern or exactly at 90° from the side. Slight variations in angle from those views show more of the shape of the boat. Try not to be up high when shooting. The closer you are to the water level the more impressive the result is likely to be. Sailboats look very much better when the sun comes through the sails at an angle, causing shadow patterns.

Motorboats are more exciting when turning than when going straight. If you want to make your uncle's 42-ft. cruiser look its best, let him circle you rapidly at a reasonable distance. First, it will break up the water and cause some spray. Second, you'll have a variety of lightings. Third, it should bank (lean) in a bit as it turns. (And besides, there's always the chance that he'll capsize and make a real picture.)

Best times for best light

I've found that the hours between 10:00 A.M. and 2:00 P.M. usually don't produce many fine boating pictures. The light's too high overhead. Early morning or late afternoon sun throws long, interesting shadows. And the warm golden tones of the late sun lend a special touch to color.

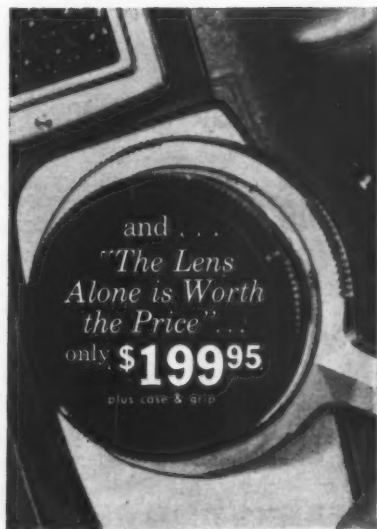
As compared to the bright, cloudless days of midsummer, I prefer the spring and early autumn. The air is generally clearer and there's a greater variety and quantity of clouds.

There's an immense amount of light over the water, even on an overcast day. Exposure meter readings can be deceptive. With color I've had very good results using a rather unorthodox technique. I aim the meter cell at the brightest important part of the scene. Since a sky is usually important in over water scenes, I aim the meter right at the area to be included. This produces slides of rich, solid tones, with texture in even the light areas, such as white clouds or sails. Incidentally, I always use a Skylight filter with Kodachrome, Daylight Type. It has no effect on exposure.

Black-and-white exposures are, in my opinion, trickier than color when shooting over water. I find that an orange filter produces the kind of sky/sea/subject contrast I like. However, a medium yellow will do quite well, too, and has one advantage. For an orange filter, exposure must be increased 4X; for a yellow, only 2X. So, faster shutter speeds are possible.

In the past, I've doubled the exposure index (of American films), made
(Continued on page 38)

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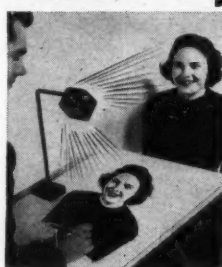
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(Continued from page 23)

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35MM

(Continued from page 36)

due allowance for the filter, and employed "average" meter readings. That is, with a reflected light meter, I used a point midway between readings for important highlights and shadows. An incident light meter of the "ping-pong ball" type is excellent for such exposures, and is simple to use. When the new ASA exposure indexes come into use, don't double them.

In bright conditions, the intense colors possible with Kodachrome are particularly suitable for over-weather pictures. In exciting bad weather scenes, when high shutter speeds are needed, High Speed Ektachrome or Super Anscochrome are almost a must.

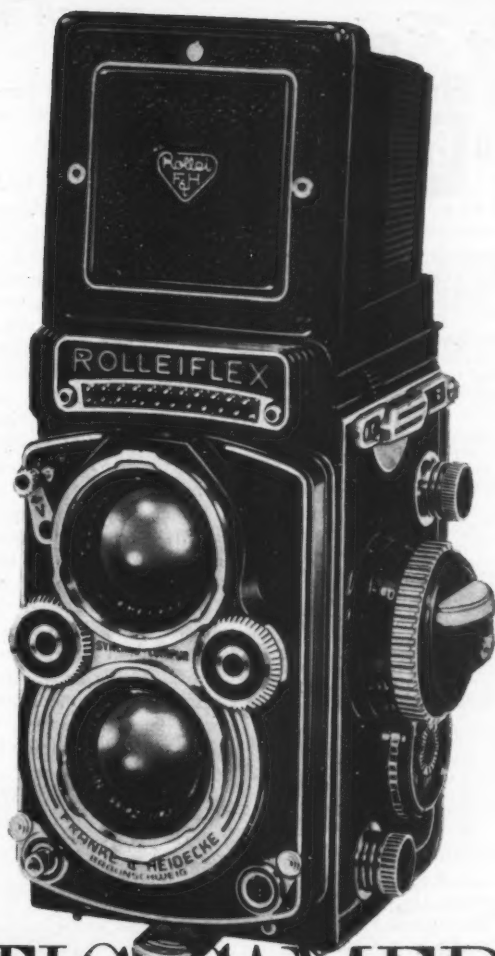
For black-and-white I prefer a medium fast (Kodak Plus-X Pan) or medium slow (Panatomic-X) film. The very slow films (Adox KB-14, for example) are great, if you can shoot from land. But when bobbing around in a boat I find they don't allow high enough shutter speeds.

Salt water has an absolutely murderous effect on a camera. Protect every part of it from spray. If it gets splashed, wipe it off quickly with a fresh-water-dampened cloth. I always carry along some of those transparent plastic film bags that shirts and things come in. These give excellent protection to equipment not in use. You can fasten one around your camera, leaving just a flap to be raised away from the lens for shooting. If you plan any real rough water stuff, it would be worthwhile to buy an inexpensive underwater housing or plastic bag with a clear face plate.

And if your camera, meter, or other equipment goes overboard in salt water, kiss it goodbye. Try to save it for evidence for the insurance company, but don't expect that it will ever be A-1 again.—THE END

Considering a camera with coupled meter in order to obtain perfect exposures without effort? That's fine, but don't stop there. Look for one that will also provide all the other features essential for perfect pictures — such as quick, accurate focusing and composing; automatic depth-of-field indications and filter correction; practical negative sizes; top-quality lens and shutter; and camera construction that has been proved over long years. You'll find all these features and more . . . more than in any other camera . . . in the Rolleiflex "F". Be sure to see it at dealers to-day.

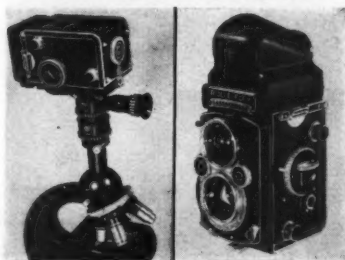
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FRENCH MOVIE

(Continued from page 25)

miles and nearly three months, these dolly shots move at exactly the same speed.) The effect is startling, and startlingly simple.

Enough has been said to suggest that the impact of *Hiroshima, Mon Amour* is due largely to Resnais' mastery of timing and rhythm—the least tangible but perhaps the most important elements of movie technique. It would be possible, though tedious, to analyze the whole movie rhythmically, like a musical score. Let's just give two examples.

Resnais skillfully uses his sound track to maintain the basically slow but tense rhythm of the movie. Silence is one of his strongest ingredients. The speech of the two main characters (practically the only ones that *do* speak) is given a deliberate, incantatory quality. The music is always restrained. In one scene—outside the Frenchwoman's hotel in the morning, when the architect asks to see her again and she hesitates, finally refusing—a lesser director might have used surging music. Resnais simply introduces into the background a truck and two motorcycles, which roar restlessly about an empty lot.

In the lengthy cafe scene, punctuated by the flashbacks of Nevers, the Frenchwoman leans back from the table, her face in shadow. The intercutting between present and past increases in tempo, and then she raises her voice



Resnais directs the cafe scene.

hysterically and leans forward. The light shines full on her face. The Japanese slaps her, hard. The barman waits, shocked by the sudden noise. The woman subsides into shadow, and the slow, tense rhythm is resumed.

High praise is due to novelist Marguerite Duras, for the script; to Giovanni Fusco, for the music, and to Emanuele Riva and Eiji Okada, for their performances. All the more praise to Alain Resnais, that he has harmonized all these fine parts so that they enrich one another. *Hiroshima, Mon Amour* is one of the most successful attempts ever made to present the complexity of human experience in the simple and objective terms of the film.—W.H.J.

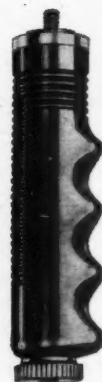
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With everyone rejoicing over the advent of the new faster color films such as High Speed Ektachrome and Super Ansochrome, it may seem enigmatic to suggest there are good

reasons why you may need to cut down the speed of your color film at times. Let me give you one illustration. You are shooting in bright sunlight and your meter calls for an exposure of 1/500 at f/16. Unfortunately, the background behind your subject is ghastly and you want to open up your lens to f/5.6 or so to throw the background out of focus. How can you do it without overexposing your film?

I've been relying more and more on neutral density filters to haul me out of just such predicaments. Neutral density or N.D. filters are gray, and do not generally affect color rendition. They simply cut down the amount of light reaching the lens and thus allow you to use a larger lens aperture or slower shutter speed or both. For example, a 2X N.D. filter cuts the light in half, and permits you to open the lens one stop or cut shutter speed in half. A 4X N.D. filter cuts the light to one-fourth strength; an 8X N.D. to one-eighth strength, and so forth. Incidentally, you can use a polarizing filter as a 3X to 4X N.D. Sometimes N.D. filters are labelled with their log densities, such as .30 (2X), .60 (4X).

When using N.D. filters, simply divide the film's exposure index by the factor and use this lower index in setting the film speed on your meter.

In what instances is it advisable to cut down shutter speeds with the aid of N.D. filters? I've found that beach scenes involving water are best made at slower than the highest shutter speeds. When the wave action or the ripples in a stream, for that matter, are stopped dead, the result does not resemble water so much as glass. A slight blur caused by a 1/50, 1/60 up to 1/125 sec. or so speed will produce a far more realistic result. Same thing goes for girls with windblown hair. Stop the hair sharply and it's unnatural looking. By employing N.D. filters you can have perfect control over your shutter speed for pictures of this kind.

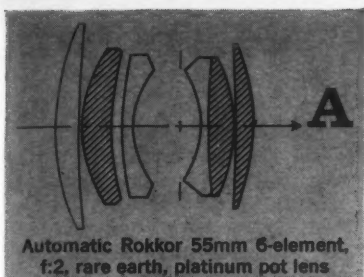
From the creative, now let's turn to a more technical use of N.D. filters —when shooting flash or electronic flash. Suppose you're trying to use flash as a fill-in light source outdoors but the flash is too powerful when used close to your subject. Try slipping an N.D. filter over the flash reflector instead of the lens. At a working distance of 3 feet, a 2X or 4X N.D. filter will be helpful. You can purchase large Kodak N.D. filters most economically in gelatin form. These are available normally in 2-in., 3-in. and 4-in. squares and in larger sizes on special order. For protection, bind them between sheets of clear acetate. Two devices which act as 3X neutral density filters and are made to fit over flash reflectors are the Enteco Polari-Flash and the Tiffen Flash Pol. Write to Enteco Industries, 610 Kosciusko St., Brooklyn 21, N. Y., and Tiffen Optical Co., 71 Jane St., Roslyn Heights, L. I., for literature on these products.

To help you pick the proper N.D. filter for each situation, I've made up some special tables. One indicates which filter to use when you want to use a larger lens aperture. Another tells you which to use for a slower shutter speed. A third lists all currently available N.D. filters, their percentage transmission, log density, filter factors and the names and addresses of their makers. You can obtain these by sending 10¢ to Neutral Density c/o MODERN PHOTOGRAPHY, 33 W. 60th St., New York 23, N. Y. Other literature which I recommend is the *Tiffen Filter Manual*, obtainable for 15¢ from your dealer or Tiffen Optical Co., 71 Jane St., Roslyn Heights, L. I., N. Y.; the 75¢ data book, *Kodak Wratten Filters for Scientific and Technical Use; About Filters, Closeup and Minus Lenses*, for 25¢ from Spiratone Inc., 369 Seventh Ave., New York 7, N. Y., and *Filter Guide*, by Norman Rothschild and Cora Wright, available at your dealer for \$1.95 or from Amphoto, 33 W. 60th St., New York 23, N. Y.

Some words on Afgacolor

We've been receiving a number of letters from readers rather puzzled with results that they've been getting from Afgacolor film. We've been referring the problem directly to the Agfa representatives here, and one of my readers, Bert Berger, of Mount Vernon, N. Y., has sent us a very interesting letter and an enclosure from Agfa, which, I think, sums up the situation in a nutshell. Berger writes: "Not too long ago, you (MODERN) ran a big spread on the merits of Agfa-

(Continued on page 46)



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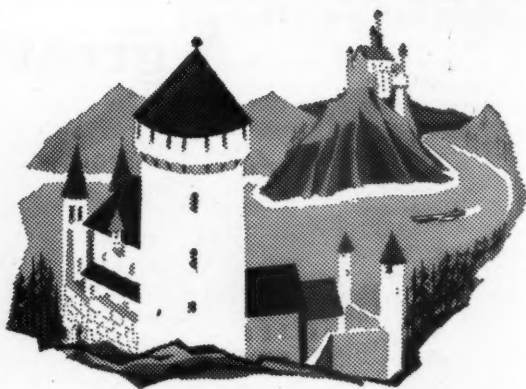
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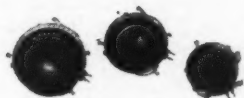
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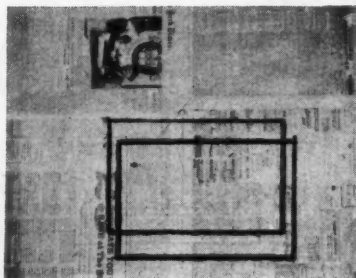
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MOVIE MAKER

(Continued from page 33)



e. The difference between the two indicates how much the camera must be shifted after framing the subject to shoot precisely the view you see when at same camera-to-subject distance as in the test.

This system can also be used to check parallax correction marks if the finder already has them. The Polaroid print test will tell you at what distances your finder is corrected for parallax; or if it is in error at the focus setting specified by the instruction book.—THE END

MODERN COLOR

(Continued from page 42)

color. I believe you owe it to these same readers to apprise them of the problems in processing. . . .

"I am sure the film is inherently better than present results indicate and that the difficulties eventually will be cleared up. But with the situation as it is now, many people are purchasing Agfacolor with no hope of getting the results that have been advertised (and editorialized) for the film."

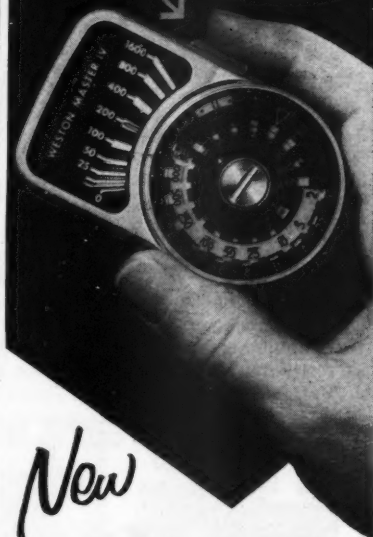
Here is Agfa's reply: "When the difficulties began, one of the originators of Agfacolor and the chief electronic engineer of the Munich plant in Germany came to this country, at our request. The fact that the American equipment was not capable of handling the Agfacolor was and could be discovered only after sufficient normal production experience by them, whereupon special equipment was flown into Philadelphia to correct the situation. This, we believe, will produce the quality of prints to our original expectations. However, until we have seen that the production of long runs on the process can be maintained at a desirable quality, we will make no definite statement, but will make it when everything is to our satisfaction. In the meantime, may we ask your very kind indulgence in a very embarrassing situation and that is to maintain faith in the quality and excellence of a product that has already proven itself elsewhere."—THE END



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Series VIII	\$4.98	\$4.98	\$4.98	\$4.98	\$4.98	\$4.98	\$4.98
Series IX	\$4.98	\$4.98	\$4.98	\$4.98	\$4.98	\$4.98	\$4.98
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Plus 3 (std.) (to 10")	1.54	1.94	2.44	3.34
Plus 4 (to 8")	—	1.75	2.00	3.25
Plus 5 (to 7")	—	1.95	2.30	3.75
Plus 6 (to 5 1/2")	—	2.25	2.75	4.25
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Double Retaining Ring	.85	.85	.95	1.50
Leather Fitterband holds 6 filters, closeup lenses. If bought with \$5.00 worth filters, closeup lenses.	1.00	1.00	1.25	1.50

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Take an SLR camera (Exakta, Praktiflex, Pentax, etc.), add an extension tube (preferably focusing) set or a Bellowscope, place between camera body and your lens (preferably telephoto), and add one of Spiratone's Minus Lenses, in front of the camera lens... and you've got a longer telephoto than you started with. Different Minus Lenses make different focal lengths. For example, a 135mm lens becomes 155, 185, 227, 294mm with Minus 1, 2, 3, 4 Lenses. *EXCEPT: Minolta, Contaflex

NAME YOUR LENS

All prices include excise tax. Postage and insurance MUST be prepaid: whether shipping weight is stated or not. Check with local post office if uncertain. Over-payment is credited in full. Everything listed is brand new and fully guaranteed against defects. 25% deposit on C.O.D.'s. Items marked "Free", "Premium", or "Bonus" MUST be requested at time of purchase. Allow extra postage, handling for foreign orders.

When ordering accessories, be sure to name your camera, lens, shutter.

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SEPTEMBER, 1960

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500 Watt T104, SC, BAY CLS.	reg. ea. \$2.50	2 for \$3.25
500 Watt T10, CAX	reg. ea. 4.18	2 for 4.18
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500 Watt Tri-Focus-DARK C130	reg. ea. 4.40	2 for 4.80
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1,000 Watt T12, DFT	reg. ea. 6.00	2 for 6.00

Specify code wanted. Shipping Charge 25c per 2

3 UNIT REFLECTOR OUTFIT \$5.99

Two aluminum-10" reflectors for #1 or #2 bulbs

One bullet reflector for spot effects

All three complete with swivel joint, switch, socket, clamp and cord... at a fraction of their usual cost.

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Super Sensitive photoelectric reads reflected and incident light; settings for all shutters, incl. movie, Polaroid, LVS, EVS, ASA speeds from 3 to 3200; stop range from 1 to 32; shutter speed range from 1/1000th to 1/6 seconds. Sh. Ch. 25c

Extra Sensitive booster with incident attachment, for poor light readings, list \$3.50, only \$1.75

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Fits accessory clip of all popular 35mm cameras. ASA speeds to 3200, 1 stop range to 32, speeds to 1/2000th, LVS-EVS, movie scales, 1/4" LVS, incl. leather case, metal strap and clip, list \$9.95. Shpg. Chg. 85c

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Shipping Charge 30c

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P4	4"	1.35	1.10
P6	7"	1.85	1.50

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with special trimmer hollow-ground hardened steel blade on spring—ready to be screwed onto board. Knife Assembly for 10" model total length 14 1/2" \$2.49; for 14" model total length 19" \$3.79. Sh. Wt. 2 1/2 lbs.

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Shipping Weights 3, 3 1/2, 4 & 8 lbs.

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150 mm	150 mm	150 mm	300 mm	240 mm
200 mm	200 mm	200 mm	400 mm	320 mm
300 mm	300 mm	300 mm	600 mm	480 mm
350 mm	350 mm	350 mm	800 mm	560 mm
400 mm	400 mm	400 mm	1000 mm	640 mm

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MAGNIFYING HOOD \$2.95 PPD

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Without installation, the Junior Minidapter enables you to use 35mm film in your 120 Roliflex, Roliflex, Yashica, Ricoh, Minolta, etc.—yet, you can change back to your regular size any time you wish. Minidapter comes complete with groundglass mask, carry-on carrying adapter, counter, ready for use. Shpg. Chg. 15c

35. MINIDAPTER has additional finder for vertical and horizontal shots, special bracket for finder and counter.

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Perfect portraits and close-ups every time—sets fit cameras without any adapters, are guaranteed to equal \$20.00 sets in performance. #1 set focuses from 3" to 50"; #2 set from 20" to 100". \$2.95 price includes 2 close-up lenses, prism. Leather case, single 30c, double 85c.

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NEW: Cld. #3 Bayonet Mount set, 17" to 10"; in leather case \$4.79

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Your choice of red, green, yellow, 82A, 80B, 85C, Skylight, diffuser.

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Fits Roliflex 3.5, Autocord, Yashicam, other bayonets, holds flashgun in ideal position.

COMBI. OFFER B-F: Flash Mount with BC Bouma Flashgun, with tester, standard cord, ext. outlet, \$5.55

Sh. Ch. list \$10.95

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\$9.98 Compensates for difference between viewed and exposed images—works even with extreme closeup lenses!

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with case

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ULTRA MINIATURE

by JOSEPH D. COOPER

Developing and printing part IV. Care and cleanliness: the secrets of successful film processing.



Basically, the procedures for developing ultra-miniature and larger film sizes are the same: Load the film into the tank (as described in my June 1960 column); pour in the developer; agitate

as specified for the recommended time; pour the developer out and the short-stop in; pour the shortstop out and the fixer in; agitate intermittently for five or ten minutes; and wash the film.

But don't be misled. There is a difference—and a most important one—in the technique you must use when processing ultraminiature film: the degree of care you must exercise for satisfactory negatives. If you are careless or untidy, the greater degree of enlargement to which your negatives will be subjected will emphasize the imperfections which result.

Make sure that the developing tank and any other utensils you use are spotlessly clean and free of lint, dust, and chemical deposits. Always handle the film by its edges.

Usually, any dust that falls on the negative after exposure can be eliminated by using a water rinse after the film is in the developing tank, and before the developer is poured in. This rinse also helps eliminate air bubbles on the film, which prevent the action of the developer and cause clear (undeveloped) spots on the negative. If you prefer not to use a pre-rinse, put a few drops of a wetting agent such as Photo-Flo in the developer to assure even distribution and minimize the risk of air bubbles collecting. To prevent irregular action of the developer, agitate continuously for about a minute and then intermittently in accordance with developer instructions.

Avoid impurities in the developer, such as fibrous material or specks of undissolved chemicals by using fresh developer or by carefully straining a developer that is used more than once through filter paper or absorbent cotton in a funnel.

The most difficult problem is in the control of solution temperatures. Usu-

ally, all the steps in processing—developing, fixing, washing—are performed at a uniform temperature of 68°F. If the temperature in the room is much higher or lower, you may find changes taking place in solution temperatures. And if you live in an apartment house or if other people in your home are using the hot water, the temperature of water coming through your mixing faucet may fluctuate violently. To control the temperature of the various solutions prior to the final running-water rinse, I suggest that all of these be prepared in advance so that the temperatures may be stabilized uniformly. Once you have achieved the desired temperature, the containers of solution should be placed in a basin of water which is at the same temperature as the solutions.

Another aid in avoiding difficulty caused by temperature fluctuations is to carry out all operations as quickly as possible. A rapid fixer reduces the time to 2 or 3 minutes from the standard 5 or 10. And a hypo clearing agent can cut down washing time to five minutes from the usual 10 to 30. With a hypo clearing agent, you first wash the film for about 30 seconds in plain water, and then immerse it for one or two minutes in the clearing agent before completing the wash.

Before the film is removed from the tank after washing, put in a few drops of a wetting agent, such as Kodak Photo-Flo. This reduces surface tension, enabling water to drain off the film with least risk of water spotting. Sometimes I use a sponge to remove surplus water with successful results, but sometimes, also, I get scratches. I'd rather risk a few water spots.

Check your thermometer

There is no substitute for determining your own developing times and temperatures for the various films. Manufacturer's recommendations should be used as a starting point: but if you find that you are getting consistently over- or underdeveloped negatives, you should conduct a series of experiments, increasing or decreasing your time accordingly. The difficulty could easily be in your thermometer, since the markings on many thermometers sold for photographic use may be off plus or minus a few degrees. The best way to check any error in calibration is to check the thermometer against a Kodak Process Thermometer or other thermometer which is guaranteed accurate.—THE END

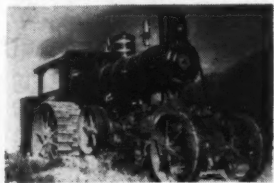
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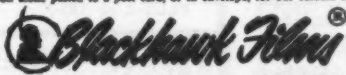
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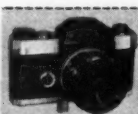
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Some facts about lenses: their potential, and a basic classification according to design.



Properly treated, any high quality lens may last indefinitely. And a "used" quality lens will perform just as well as a "new" one although it usually costs considerably less. Consequently, buying a used

lens instead of a new one can save you a great deal of money, provided you know what you are buying. This, again, depends upon two factors: the inherent potential of the lens in terms of performance, particularly in regard to sharpness and covering ability, and its state of preservation.

To judge the quality of an unfamiliar, secondhand lens and decide whether it is worth while testing, a photographer should consider two points: the construction of the lens, and the name and reputation of its manufacturer. Most old lenses made for large cameras which bear one of the following firm names are worthy of further inspection: Cooke, Dallmeyer, Goerz, Ross, Schneider, Steinheil, Voigtlander, Zeiss.

In regard to lens construction, a photographer should know the following before he goes to the trouble of testing a prospective lens: every high-performance lens consists of a front element and a rear element with an adjustable diaphragm (and often a shutter) in between. Lenses lacking a diaphragm or consisting of a single element only, are usually not worth considering. Whether a lens is mounted in a shutter or in barrel mount (no shutter) is basically of little importance since most old lenses (except the very large ones) can easily be mounted in modern Ilex, Compur, or other types of between-the-lens shutters. I classify lenses into six basic groups. In most cases, the examples I give are available in a number of focal lengths.

1. *Single group*: This lens consists of a single component (not to be confused with a single element) with an exterior diaphragm. As a rule, lens speed and performance are of a very low order.

2. *Double group*: A lens consisting of
(Continued on page 56)

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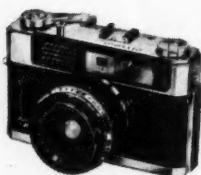
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THE LARGE CAMERA

(Continued from page 54)

two identical or closely similar cemented components arranged symmetrically around a central diaphragm. Some lenses belonging to this group (double objectives) are constructed so that each of their elements can be used by itself, having a focal length considerably longer (or twice as long) and a speed approximately one-quarter as high as that of the complete lens. Typical and well known representatives of this type are: the Dagor (Goerz), Symmar (Schneider), Angulon wide-angle (Schneider), Turner-Reich Convertible (Gundlach), Collinear (Voigtlander), Orthostigmat (Steinheil), Ross Convertible Doublet, Cooke Convertible Anastigmat (Taylor-Hobson), and Zeiss Protar Series VII-a. Any one of these is available in a variety of different focal lengths. If in a good state of preservation, each merits careful consideration and is potentially a good buy.

3. *Triple group*: This lens consists of three airspaced components, any one of which may be either single or cemented (two elements). Whereas most double group lenses rate high on the performance scale, triplets vary enormously depending on make and design; some are excellent and others are very poor performers, with the great majority rating somewhere in between. Furthermore, equality of focal length provided, triple group lenses have always less covering power than lenses of double group design. The front or rear element of a triple group lens can not be used alone. Among the few old lenses of triplet design that are suitable for large cameras and can be recommended unreservedly are the f/6.3 Tessar (Carl Zeiss), Xenar (Schneider), Heliar (Voigtlander), Skopar (Voigtlander), Xpres (Ross).

4. *Quadruple group*: The lens consists of four airspaced components (some of which may be cemented). This group contains many of the finest lenses suitable for use in large cameras. In particular, be on the lookout for the following: Apo Skopar (Voigtlander process lens), Aristostigmat (Meyer wide-angle lens), Artar and Gotar (Goerz process lenses), Commercial Ektar (Kodak universal lens), Dogmar (Goerz), Wide Field Ektar (Kodak wide-angle lens), Rectagon (Goerz wide-angle lens).

5. *Petzval*: The lens consists of two thin, positive, dissimilar, widely spaced components. This is the typical old fashioned "portrait lens" characterized by relatively large aperture and insufficient covering ability. Most of the huge, sometimes hand-engraved lenses in unproportionately long brass barrel mounts belong to this group. Because of their large size and a tendency to vignette badly, these lenses have little practical value today. Occasionally, however, a long-focus, inexpensive Petzval-type lens can successfully

(Continued on page 134)

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MODERN PHOTOGRAPHY

TOO HOT TO HANDLE

How does the Bronica stand up to the Hasselblad 500C?—P. W. Black, 101 West 23rd St., New York 11, N. Y.

Briefly, here's the story: The Hasselblad 500C has received good acceptance among professionals. Lenses are all top notch. Camera is superfast in operation—especially with the wind crank accessory. Quiet leaf shutter is shake-free and excellent for both electronic flash and regular flash sync. Bronica, emerging from its bout with growing pains, is just getting into the field. Besides first-class lenses, it has scores of extremely useful and advanced features—rapid-return mirror, instant-return diaphragm, wide lens interchangeability because of focal-plane shutter. The shutter, however, makes it more difficult to sync, particularly with electronic flash. Film magazines must be handled carefully but are more automatic than Hasselblad magazines in that you don't have to set the first exposure in a window, nor do you have to make sure back and camera are both wound or are both unwound when attaching the magazine.

The two cameras differ radically in their focusing arrangements. The Bronica uses one knob for both focusing and film wind. First focus, then pull the knob outwards and wind two turns to the next exposure. If you don't change focus between shots you can do this fairly rapidly, and a rapid wind crank is promised. With Hasselblad, you can keep in focus by turning the lens mount focusing ring and run through about 15 shots in 12 seconds with the rapid wind crank.

Best bet for anyone caught in the "shall I buy the Hasselblad or the Bronica" battle is to handle both in a store and compare your various likes and dislikes of each camera.

What constitutes the variance in price between pentaprisms for Exa and Exakta cameras? Almost every month I see advertisements for such prisms and seldom do these prices compare with one another.—R. L. Mendels, Grand Rapids, Mich.

Counterfeiting isn't limited to money. Several firms other than Ihagee, makers of the Exakta and Exa cameras, make prisms. With few exceptions—if any—all are inferior in brilliance and a few

seen at MODERN even produced errors in focusing. Naturally, these are cheaper. Make sure you get a genuine Ihagee pentaprism, as imported by the Exakta Camera Co., 705 Bronx River Road, Bronxville, N. Y. A few years ago we even saw a pentaprism with the name "Ihagee" forged!

A MODERN article led me to believe that the Zeiss monocular would work well on my Voigtlander Bessamatic, but Zeiss has advised me that it's only for their camera. Who's right?—Archie Kent, Bucyrus, Ohio.

It's a matter of available adapters. A special adapter to fit your camera can be ordered through your photo dealer from the Tiffen Optical Co., 71 Jane St., Roslyn Heights, L.I., N.Y. Price, Tiffen tells us, varies from \$4 to \$10 for different makes of single-lens reflexes.

Do you have any information or test results on the 135mm f/4.5 Accura short-barrel mounted lens and bellows unit offered for \$24.95?—Clem G. Wiedman, Lansing, Ill.

While we haven't tested the lens thoroughly alone, we did use it extensively for a story on minus lenses for telephoto effects. At that time we noted that definition at full aperture was fair, but reasonably good at f/5.6 or so. At the price quoted with a bellows, it's an interesting unit, allowing you to focus from a few inches to infinity using a single-lens reflex with focal-plane shutter.

Would you compare the Yashicamat to the Rolleiflex 3.5E?—Robert Ettinger, Yonkers, N. Y.

We regard comparisons between these two cameras as being unfair to both, since they are in such different classes, although both are $2\frac{1}{4} \times 2\frac{1}{4}$ twin-lens reflexes. The Yashicamat is an amazingly complete automatic twin-lens reflex with a good four-element 80mm f/3.5 lens. At \$75.50 it certainly must be regarded as a good buy. The Rolleiflex 3.5E at \$249.50 has a five-element 75mm f/3.5 Schneider Xenotar lens, one of the sharpest lenses ever computed for covering a $2\frac{1}{4} \times 2\frac{1}{4}$ negative—even at full aperture. In addition, the Rolleiflex has automatic parallax com-

pensation, automatic film feed and scores of other time-tested features.

I have heard that the Konica people changed the quality of the 50mm Hexanon f/2 lens in the IIM camera because the Hexanon f/1.8 of the IIA was too expensive to produce on the less expensive model. True or false?—Herbert G. Sanbeg, New Dorp, Staten Island, N. Y.

False. We've found that, aside from being slightly slower in maximum speed, the lenses are quite comparable in quality at like apertures.

Is the 7-inch Aero Ektar f/2.5 suitable for portrait and general photography when mounted on a $3\frac{1}{4} \times 4\frac{1}{4}$ Graflex?—R. L. Morgan, Urbana, Ill.

It is definitely not suitable for either at medium or close focusing distances. The Aero Ektar was designed for aerial use at an infinity focus. For long shots you can't get a sharper, better lens at any price. However, the designers had to sacrifice some part of performance to get such quality. Thus, definition suffers at close distances, where the lens was never designed to be used anyhow.

My Baldessa Ia shutter is marked with speeds of 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{15}$, $\frac{1}{30}$, $\frac{1}{60}$, $\frac{1}{125}$ and $\frac{1}{300}$. Would it damage the shutter to operate it between these markings, at, for instance, a speed of $\frac{1}{45}$ sec. or $\frac{1}{250}$ sec.?—Craig L. Johnson, Boulder, Colorado.

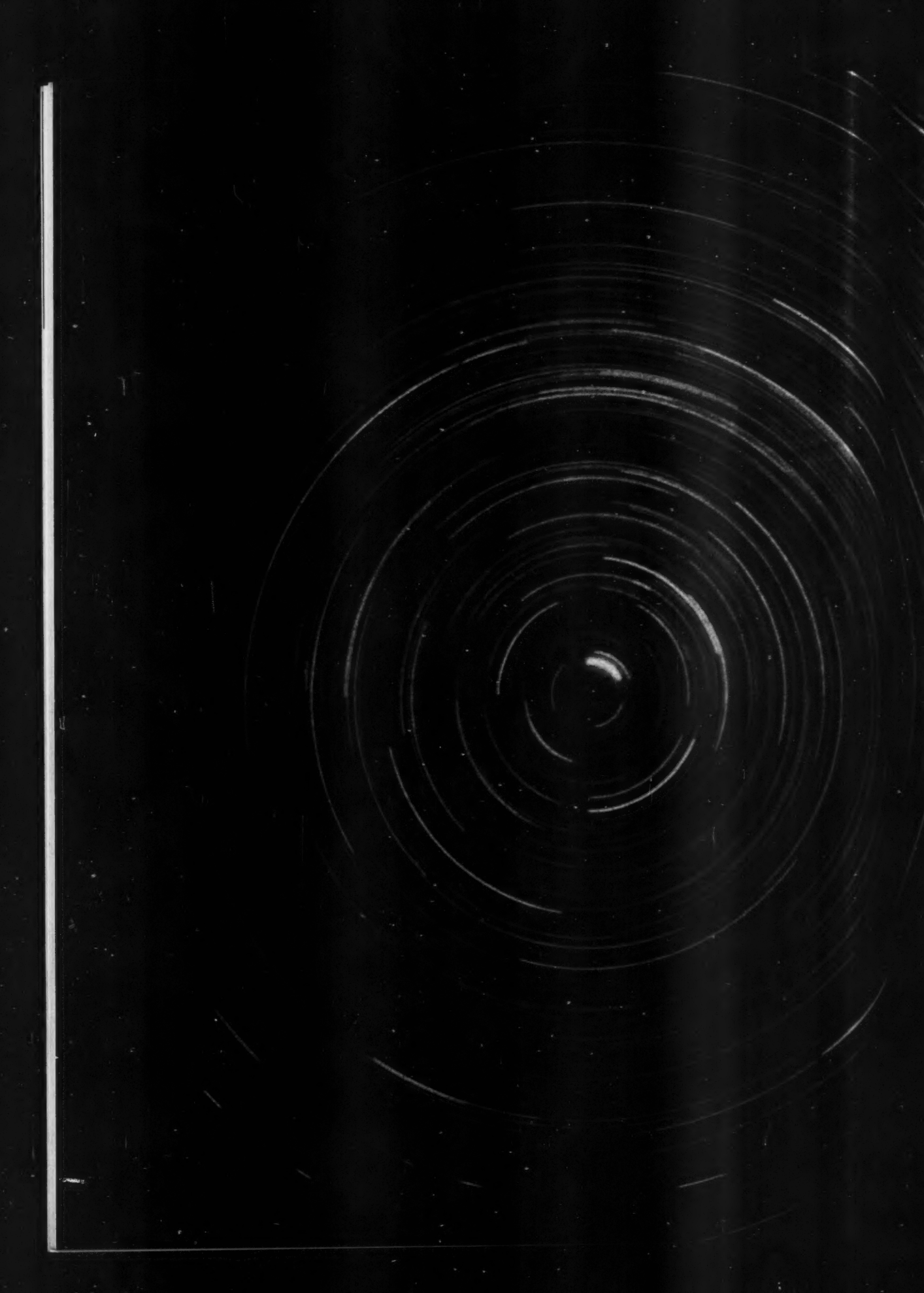
Sorry, but the construction of your Pronor LVS leaf shutter won't let you get between-the-marks speeds even if you can set the shutter ring to them. Your shutter won't be damaged but you'll get either the high or the low speed, depending on which setting is nearest.

I am contemplating buying a Nikon S-2 with the 50mm Nikkor f/1.4 lens. I have seen it advertised in your magazine for about \$130 to \$160. Is there anything wrong with this camera?—E. L. Obermiller, Anacortes, Washington. Nothing wrong. Following the introduction of improved Nikon models, the S-2 was discontinued in 1958 and the price officially reduced by the importers—but not that far. The camera is a good bargain if it is new, if it is available with the original factory guarantee and a store guarantee.

Is there any possibility that Leica will introduce a single-lens reflex within a year?—Raymond A. Lien, Los Angeles, Calif.

None whatsoever.

I have reached a point of confusion in the search for an ideal single-lens reflex in the \$150 to \$250 price range. Basically, I want the best available optics with perfect resolution and definition at f/2.8, complete interchangeability of lenses up to and beyond 135mm, plus maximum mechanical reliability. My search has narrowed to the Helland Pentax, Retina Reflex, Contaflex Super, (Continued on page 116)





OUTER SPACE PHOTOGRAPHY

FROM YOUR BACK YARD

**LOOKING FOR NEW WORLDS TO CON-
QUER? STARTING WITH JUST THE
CAMERA YOU NOW OWN, YOU CAN
SHOOT STARS, METEORS, COMETS,
ARTIFICIAL SATELLITES, THE SUN
AND MOON. DR. HENRY PAUL, AN
AMATEUR ASTROPHOTOGRAPHER
FOR OVER 20 YEARS, TELLS YOU
HOW ON THESE SIX PAGES.**

STAR TRAILS are spectacular, easy-to-take. Choose clear night, mount camera on tripod, expose for one hour or more. Paul W. Davis used Commercial Graphic, 127mm f/4.5 Kodak Ektar lens, Tri-X. 4 hours at f/4.7.



METEORS can be captured with luck. Dr. Paul caught this one at end of one-hour exposure using home-made camera box with f/3.3 Bausch and Lomb W. A. Survey lens, Kodak 103aE beeked plate. He chose an aperture of f/8.



COMETS are rare but worth waiting for, need only short exposure. Paul W. Davis used Commercial Graphic, 12-in. f/2.5 Kodak Aero Ektar lens, exposed for about 1 min. at f/2.5 on Royal-X Pan. (Note how star motion is visible even in this short time.)

ALTHOUGH THE SPACE AGE has already arrived, with artificial satellites orbiting many hundreds of miles above our heads, there are still few photographers who ever point their cameras upward at the planets and the stars. When most of us look at the infinity mark on our focusing rings, we think of it as meaning 50 or 100 yards, or at most a few miles from the top of a hill; but it also means, of course, that we can focus with perfect ease on an object 250,000 miles away (the moon) or even 750,000 light-years (the Andromeda galaxy). Why don't we do it? Because we imagine that special, complicated, expensive equipment is necessary. Because we have seen photographs of the stars or of our neighbor the moon credited to Mount Wilson or Palomar, and imagine that we must shove a 200-in. tracking telescope through our ceiling to achieve any worthwhile pictures of space. These beliefs are completely erroneous. All the pictures on these pages were taken by amateurs; all except those on page 63 were taken with ordinary or home-built cameras using either simple accessories or none at all.

With just the camera you already own you can start shooting the sky from your backyard. With the simplest of telescopes, such as a rifle target spotting scope, you can extend your range immeasurably. Let's look first at the minimum requirements for astronomical photography.

What lenses are best? Broadly speaking, your lens should have an effective opening (clear aperture) of at least 1 in. (25mm) in diameter. To find this value simply divide the focal length of the lens by its f-value (the actual diameter of the lens front is not a reliable measure). Accordingly, the 50mm f/2 lens of a 35mm camera meets this minimum requirement, as does a 75mm f/2.8 lens of a 2¼ x 2¼ camera and the commonly used f/4.5 normal lens on cameras taking larger film sizes. So the normal lens on your camera is more likely than not to fulfill these conditions. There's no objection, of course, to larger lenses.

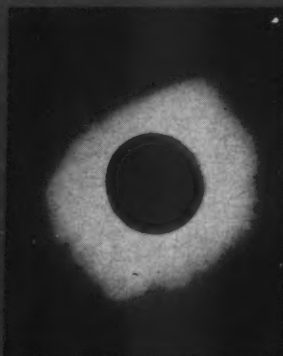
Why do I stress the effective lens opening? Because it is more important than the f-value in photographing stars (true point light sources). If two lenses of the same f-value but of different effective opening are used to photograph such objects, the lens with the greater effective opening will give a denser negative image for the same exposure. On the other hand, for objects covering an extended area—such as comets, Northern Lights, nebulae, etc.—



SUN makes fine telescopic subject—here, with DC3 flying across it. W. A. Feibelman used a 50-in., 2-in.-diameter scope, Leica camera with reflex attachment, exposed at 1/200 sec. and $f/25$ on Panatomic X.



MOON is our nearest, clearest space neighbor. Dr. Paul used Bushnell spotting scope coupled to Polaroid Land 110A, exposed wide open for 1/15 sec. on Polaroid Type 42 film. Exposures must be short or movement of moon and earth will cause blur.



ECLIPSES provide enough light for short exposures. Left, R. E. Rustad Jr.: 40-in., 3-in.-diam. refracting scope, 35mm body; $f/13.3$, 1/25, Panatomic-X. Fritz Laudenklos, Germany: Exakta Varex, 210mm $f/4.5$ Zeiss Tessar; $f/4.5$, 1 sec., Adox Dokupan.

the speed as measured by f -value (aperture in relation to the focal length) again assumes its generally accepted importance.

Any quality camera fitting the above minimum lens requirement will perform well. Generally speaking, for broad-field star constellation photography it's better to use larger cameras with longer focal-length lenses, preferably 4 in. or more. Here is an excellent place for the older film or plate ground-glass focusing cameras, which often have excellent $f/4.5$ lenses worth trying—Tessar, Aviar, Dogmar, Xpres, Xenar, Ektar, etc. Many of these cameras were made in large sizes, and Eastman Kodak provides special plates for them which are ideal for astrophotography (see *Kodak Photographic Films and Plates for Scientific and Technical Use*—50 cents from your Kodak dealer).

If you have only a small camera, don't let your spirits sink. Any 35mm camera with just a 50mm $f/2$ lens can do good exploration work on meteors, sputniks, Northern Lights or constellations. Actually, the 35mm reflex camera when coupled to a long telephoto or a telescope becomes a natural for much narrow-angle outer space photography—shooting the moon, sun, planets, etc. *There is no all-purpose camera for astronomical photography.* Get the most out of the one you have; alternatively, turn to the excellent buys in war surplus lenses and build your own star camera.

The way to the stars

If you're completely new to night photography, a good setting-up exercise is to take a few star trail photographs. We call it an exercise, but it can produce really striking pictures (see page 58). With a building silhouetted in the foreground, such a photo suitably enlarged will make you a fine wall hanging or conversation piece.

Here's how you set about it. Choose a clear but dark night and mount your camera on a sturdy tripod (use a cable release, too). Center the North Pole Star (this is the celestial axis, around which the other stars appear to revolve), and check that the foreground objects are where you want them. The lens, if $f/4.5$ or $f/3.5$, is usually used at full aperture; however, the super speed or larger lenses— $f/2.8$ or more—might well be stopped down one f -number from full aperture to improve the sharpness of the trails at the corner of the picture. An ordinary medium speed film—such as Kodak Verichrome Pan or Plus-X Pan—is to be preferred. To avoid shaking the

PHOTOGRAPHING THROUGH YOUR TELESCOPE: WHAT YOU'LL NEED AND HOW TO SET ABOUT IT

We'll assume you have a small camera—either 35mm, twin-lens reflex, or Polaroid Land 110 or 110A. Larger cameras with ground-glass backs are ideal for astrophotography, but there's no need to buy one specially. The most convenient type of smaller camera is the single-lens reflex, which solves the focusing problem. However, you can still use your favorite camera even if it doesn't offer through-the-lens focusing.

There are two main types of telescopes, refracting and reflecting. The refracting type, just like a long-focus lens in design, is more useful for the ordinary photographer, since it can be used for ground-level photography as well. The reflecting type, which incorporates a concave mirror in place of a lens, is specially designed for astronomical work and usually offers more light-gathering and defining power for the same bulk.

Before you rush out to buy a telescope, there's one problem to consider—how to couple your camera to the scope. For refracting scopes, there's no universal coupler on the market. The Bausch and Lomb Telemaster (designed for the Bausch and Lomb Balscope) and the Edmund Scientific coupler (designed for binoculars) can be adapted to certain other small refracting scopes; so can the Bushnell adapter. It's best, however, to choose a scope for which a camera coupler is specially designed, e.g. the Bausch and Lomb Balscope, Bushnell Spacemaster, Edmund Scientific 42mm telescope, Unitron 3-in. telescope, or Questar 3½-in. Consult the manufacturer about photographic adaptation.

For reflecting telescopes, two near-universal adapters are available; the Criterion model, which clamps onto the scope, and the Edmund Scientific model, which screws on (two holes have to be drilled into the scope).

With a refracting telescope, your camera lens (no matter what kind) can be coupled right up against the eyepiece for a magnified image. If you remove your camera lens, then with most refracting scopes you can remove the eyepiece and couple the camera directly to the telescope objective, which now acts as a telephoto lens. If you already have a refracting telescope for which no special coupler is made, your best plan is to contact a camera repair company and ask them whether they will make a coupler for you (some do, some don't). Ask for an estimate, as the cost will vary considerably according to the type of camera and scope. Normally, however, it will be somewhere between \$10 and \$30. If you have difficulty locating a repairman to do this work, write Astronomy Editor, MODERN PHOTOGRAPHY, 33 West 60th St., New York 23, N. Y., and we'll send you a name and address.

With a reflecting telescope, your camera with lens may be used against or near the eyepiece. If your camera has through-the-lens focusing, you can determine the correct focus and distance visually. If the lens is removable, you can also set your camera up so that the eyepiece projects a magnified image directly onto the film plane. You may find that the focal plane of the reflecting telescope is too close to the tube for you to set up the camera without lens or eyepiece as described above; in this case, you can use a negative Barlow lens to bring the image out farther. If you have neither through-the-lens focusing nor a removable lens, you can get reasonable results by centering the camera lens (set at infinity) right up against the scope eyepiece focused on the object—as described later in precise detail. In all cases where the camera lens is at a distance from the telescope eyepiece you'll need a light shield between them. You can make one quite easily out of stiff black paper rolled into a tube.

If you have through-the-lens focusing, you're now all set to shoot the stars. If you have a twin-lens reflex, you can set up the coupler so that (Continued on page 123)

camera, it is best to hold a playing card over (but not touching) the lens while opening and closing the shutter. Try several short exposures, one hour or less, to see if your framing is correct and if your location has a sky dark enough for long exposures without too much fogging of film by stray skylight. If the night sky is too bright for such a long exposure, stop down the lens somewhat. A little experimentation will take you from this point to a finished picture.

A constantly increasing number of artificial satellites and rockets will be flashing overhead during the hour after dusk and before dawn (when the sunlight is striking them but not the ground). These appear to blink on and off as they turn in the sunlight and are quite spectacular.

If you wish to try out on a satellite or sputnik that you have learned will be coming over at a given time, load up with your fastest film and mount your camera on a sturdy tripod, preferably one with a pan-tilt head; then point the camera in the general direction of the expected space object. Check that the lens is set at full aperture and on time or bulb. Choose a twilight hour near enough after sunset or before sunrise (usually within the hour) for the satellite to catch the sun's rays, and yet far enough from sunset or sunrise for the general skylight to be too dim to fog the film. Your exposure time will be relatively short—less than a minute.

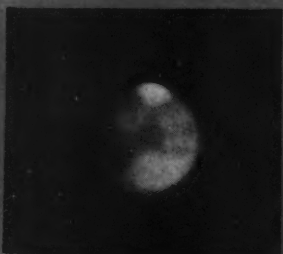
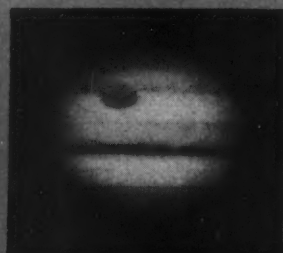
With the cable release in one hand and the pan-tilt lever in the other you are ready, on spotting the moving object, to instantly swing the camera into position, lock it there, and open the shutter. You close the shutter as soon as the object is out of frame.

You have a choice of taking a picture of the satellite coming, going overhead, or going away, depending somewhat on when the satellite comes into or goes out of the sun's rays—and on your own ability to maneuver rapidly. Actually, although the satellite is moving at 16,000 miles or so per hour, you'll have quite a few seconds to work because of its great height.

Exactly the same technique can be used for shooting meteors, the main problem here being that there's no way of knowing exactly when and where a meteor is going to appear. Success depends largely on your having the lens open and the camera pointing in the right direction at the right time. This may sound as chancy as roulette, but the odds will be in your favor if you pick dates at or near those of known meteor showers, such as the Perseids of early



GALAXIES need long exposures, therefore special drive mounting to compensate earth's motion. Alan McClure used home-built box with plate holder and 47-in. f/7 Fecker Triplet lens, exposed for 45 min. on Kodak 103aE plate.



PLANETS need fairly powerful scope, longish exposure. Jupiter (upper left) and Saturn (upper right) were taken by Horace Dall, England; Mars (lower left) by Everett Oliver, and crescent Venus (lower right) by R. E. Rustad Jr.

August or the Orionids of mid-October. The meteor photo, *top page 60*, is reproduced from a portion of a long-exposure photo of the southern Milky Way that I took with a wide-angle lens. This Perseid meteor flashed down the center of the field and ended in a couple of short bursts—just a moment before I planned to close the shutter.

Obviously, the longer your exposure, the better chance you have of catching meteors. Just how long you can expose a given film depends on the film speed and the stray sky light in your own area. Since conditions vary greatly, you'll have to find out for yourself the longest exposures that your area will permit before films fog. Here the larger cameras with moderate speed lenses—f/4.5 or f/5.6 (particularly in longer focal lengths)—have an advantage, since sky fogging takes place very rapidly with the faster lenses. With smaller cameras, however, film is inexpensive and fresh exposures can be started at shorter intervals.

Catch constellations on the move

The first thing that most people think of when night-sky photography is mentioned is the stars—all those romantically named constellations that we learned at high school but have now largely forgotten, and find it difficult to locate in the sky. To renew these old associations—and especially to teach them to children or students, if we happen to be parents, uncles and aunts, or teachers—there's nothing better than a set of constellation photographs. (Weather conditions, cricks in the neck, eye fatigue, and the difficulty of seeing exactly where someone beside you is pointing can all make fieldwork a chancy business.) To find out where the constellations are so that you can shoot them, there's a useful rotating chart called *Star and Satellite Path Finder* (published by the Edmund Scientific Co., Barrington, N.J., price 50 cents). To brush up a bit on astronomy in a pleasant painless way *The Sky Observers Guide* by Mayall *et al* is recommended—\$2.95 from Golden Press, New York.

Up until recently, photographing the constellations required a special clock-driven mounting that would enable your camera to follow the stars in their apparent motion through the sky during the relatively lengthy exposures that were necessary. But with the advent of the E.I. 1000-plus film speeds, you can now photograph a constellation from your backyard on any clear night in a few seconds, with your camera mounted only on (*Continued on page 116*)

PORTRAIT PUZZLE: IS THERE ONE BEST FOCAL LENGTH?

GRANTED that most of us don't own a dozen lenses. Granted that most of us must make do with one or two. But if we had a choice, if we had at our command an infinite variety of focal lengths, would we find that for a given subject one and one only would be best?

In order to show the advantages and disadvantages of each available focal length, MODERN assigned photographer Hal Reiff to do a sitting using lenses ranging from the widest wide-angle to a long telephoto. Equipped with a Zeiss Contarex camera, its 21mm, 35mm, 50mm, 85mm, 135mm and 250mm lenses and a model, Reiff set out for an afternoon's shooting in New York's Central Park. The pictures on the *opposite page* were selected from the results.

For purposes of discussion, we have grouped the focal lengths into six major categories. Here's some advice on how, why, when—and when not—to use them.

Super wide-angle (21 to 25mm for 35mm cameras, 38 to 52mm for $2\frac{1}{4} \times 2\frac{1}{4}$ cameras): Believe it or not, the widest wide-angles can be used for portraiture—without any apparent distortion. Actually, there are two types of distortion characteristic of extreme wide-angle lenses: one is built into the lens itself, and affects objects which are positioned at the edges of the frame; the other is a function of camera-to-subject distance. The trick, obviously, is to keep your subject near the center of the frame—and to keep your distance. Reiff made this shot from about 6 ft., sufficient to render all but the largest noses in proportion. One word of warning: when working with these lenses, watch background composition carefully. Even at a wide aperture, with focus set at no more than a few feet, the extreme depth of field of these lenses will keep the background sharp.

Wide-angle (28 to 40mm for 35mm cameras, 55 to 70mm for $2\frac{1}{4} \times 2\frac{1}{4}$ cameras): This focal-length range is ideal for showing your subject in relation to natural setting—and for using elements in this setting as dramatic, compositional props. Here, Reiff had model lean on bridge railing, which leads eye into the background,

creating a visual tension between it and the subject.

Normal (45 to 58mm for 35mm cameras, 75 to 80mm for $2\frac{1}{4} \times 2\frac{1}{4}$ cameras): This portrait was made at a distance of slightly less than 6 ft., approximately the same distance, in the same location and with the same aperture as the 21mm picture above it. The differences—in depth of field and in image size—are obvious. Actually, when used at the normal shooting distance for portraits (between about 6 and 9 ft.), the 50mm lens is a somewhat unsatisfactory compromise between the wide-angle and the long lenses. Most photographers who own both wide-angle and tele lenses do most of their portraits with them, and rarely use the 50.

Medium long (75 to 100mm for 35mm cameras, 90 to 135mm for $2\frac{1}{4} \times 2\frac{1}{4}$ cameras): With the classic portrait lens, Reiff has produced the classic head and shoulders portrait. Here, the model is on the same bridge as in 35mm shot above, and at a distance of 9 ft.—yet the background is out of focus. With this lens at this distance, distortion is negligible.

Long (105 to 175mm for 35mm cameras, 150 to 200 for $2\frac{1}{4} \times 2\frac{1}{4}$ cameras): The 135 is an ideal lens for shooting candids at a distance. If your subject is camera shy, try taking her to a location where there are people about and things going on. Then stand back and shoot away, after she is involved in the surroundings. Reiff made this shot from a distance of about 25 ft. With this range of focal lengths, and with those longer, be sure to shoot at a fairly high shutter speed: if possible, 1/100 second or more. As focal length increases, the effect of any camera movement is magnified.

Super-tele (180mm and up for 35mm cameras, 250 and up for $2\frac{1}{4} \times 2\frac{1}{4}$ cameras): If you want a big head, if you want to keep background details completely out of focus, if you can't come within five or ten feet of your subject, try a long telephoto.

For the complete story of why six photographers chose six different focal lengths for six different portrait situations, turn the page.—P.C.



SUPER WIDE-ANGLE: 21 TO 25MM



WIDE-ANGLE: 28 TO 40MM



10
NORMAL: 45 TO 58MM



MEDIUM LONG: 75 TO 100MM



LONG: 105 TO 175MM



SUPER-TELE: 180MM AND UP

How and Why

6 Pros Use

6 Focal Lengths

SUPER WIDE-ANGLE: The physical circumstances in which you are shooting may dictate your choice of a lens. On assignment for *Vogue* magazine to photograph Buckminster Fuller, designer of the geodesic dome, Elliott Erwitt chartered a helicopter to poise above the dome, while he photographed Fuller within the confines of its cabin. Erwitt needed the widest possible angle to frame both the man and his work, and the most extreme depth of field to render both recognizably sharp. The problem was solved with a 21mm f/4 Super Angulon on a Leica M3. The exposure: approximately f/16 and 1/125 sec. on Plus-X Pan.

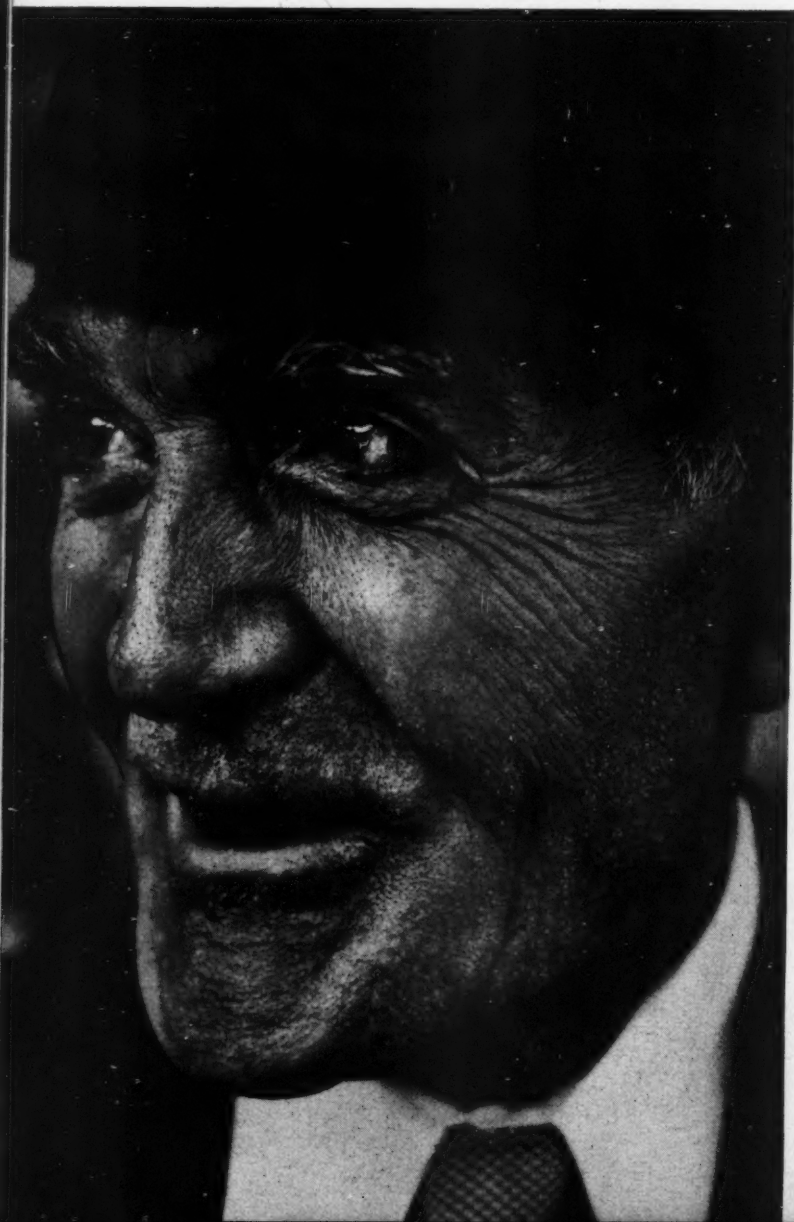
WIDE-ANGLE: In recent years there has developed a new approach to portraiture. The subject is shown in the context of his work, with the products he manufactures or with the tools of his trade rather than isolated against a studio background. Often the subject is in the foreground, with these functional props as background only, as in the photograph of Buckminster Fuller below. But just as often the subject himself is secondary and visual emphasis is placed on the props, as in this photograph of the president of Steinway and Sons, taken by Maynard Frank Wolfe. The 28 to 35mm range of focal lengths for 35mm cameras (60 to 70 for 2 $\frac{1}{4}$ cameras) is without doubt the most popular for this type of portraiture. The angle of view is sufficient for the photographer to work quite close to his subject; the lenses themselves are free of the distortion inherent in the wide wide-angle objectives and are also fast enough to make hand-held, available light exposures possible. Leica M3, 28mm f/5.6 Summaron, 1/30 sec. and f/5.6, Tri-X Pan.





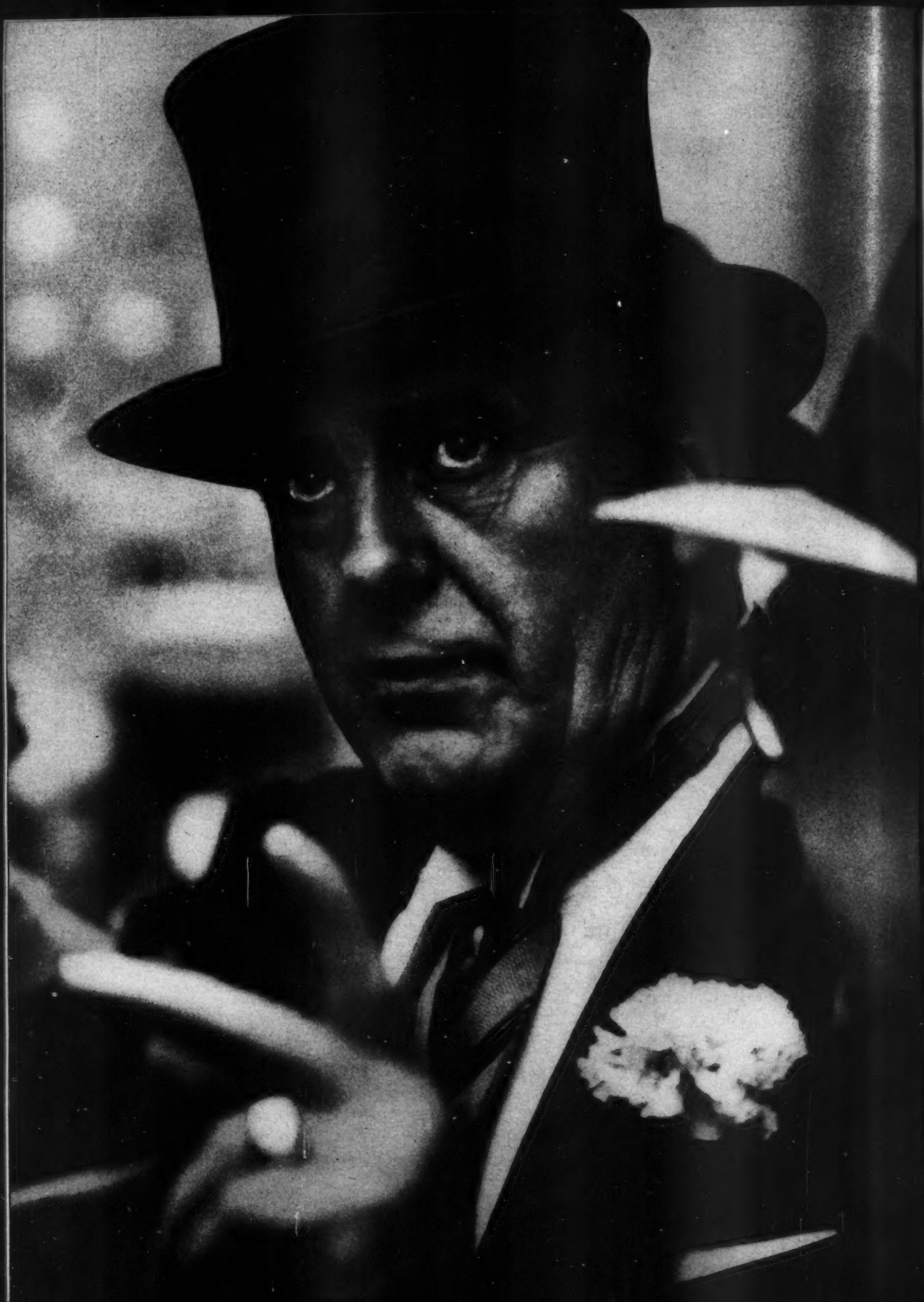
PORTRAIT PUZZLE (cont.)

NORMAL: The 50mm lens *can* be used close-up—without any obvious distortion. The main trick is to be sure your subject is not facing the camera. A three-quarter view renders features in “normal” perspective. When Ken Heyman made this available light portrait, he was out shooting to test a new 50mm f/2 dual-range Summicron. While walking around the Bowery, he came across this Irish gentleman and was impressed by his obvious good humor—and by the texture of whiskers and wrinkles on his face. Heyman asked him to pose—and he obliged. Although it isn’t possible to come in so close with most rangefinder cameras, the normal lenses on all single-lens reflexes focus to about 18 in., making close-up portraits possible without supplementary lenses. Leica M3, Plus-X Pan, 1/30, f/2.



MEDIUM LONG: This is the classic focal-length range for head and shoulders portraits. The comparatively limited depth of field of these lenses at any given aperture is an aid in throwing distracting backgrounds out of focus; the larger image size makes it possible to frame the head only without coming in close and risking distortion. Wayne Olsen made this test shot of a model with an 80mm f/2.8 Biometer lens on a Miranda camera, shooting hand-held at 1/30 second at an aperture of f/2.8 on Plus-X Pan film. The lighting in this portrait is particularly suitable for portraits of women. Soft but strongly directional, it models the features without casting harsh shadows. The light source was a special lamp, designed and constructed by the photographer: a cylindrical, fiberglass tube, about 4 ft. high and 6 in. in diameter, which is attached to a movable floor-to-ceiling pole. The light itself is provided by four 60W bulbs evenly spaced within the tube to which their sockets are taped. Olsen uses this set-up for much of his portrait work. Similar lighting can be simply achieved by bouncing a flood from a piece of white cardboard, or by using a fluorescent tube as the sole light source.





LONG: For candid portraiture these lenses are ideal. Many of them are small enough and light enough to be reasonably unobtrusive; yet the focal length is sufficiently long for you to stand at a distance from your subject and still capture a large image on the film. Since many of the lenses in this range are telephotos, which are optically designed so that their focal length is greater than the actual size of the lens would suggest, you will find a difference in the actual size and length of lenses of any one focal length. The best shooting technique if you don't want to be observed—and this is true no matter *what* lens you are using—is to carry your camera in your hand, preferably with a wrist strap (these are available through most photographic dealers and attach to the camera by means of the tripod socket) rather than wearing it in the normal, strap-around-the-neck position. The main problem in this sort of situation is exposure. Since you can't take a reading from the subject itself, and if you're shooting fast you won't want to stop to take a reading before each exposure, try taking readings before you begin to shoot. If you're in the sun, read both in sunlight and in shadows; if you're indoors, read in various parts of the room; then keep the correct exposures for each lighting situation in mind throughout the shooting session. Charles Harbutt made this photograph of a man in a top hat at the annual St. Patrick's Day Parade in New York City while shooting an assignment for *Jubilee* magazine. Nikon S2, 135mm f/3.5 Nikkor lens, Plus-X Pan film, 1/250, f/8.



SUPER-TELE: Since World War II, photographers have had a completely new tool with which to work: the light-weight, fast super-tele lenses, which are ideal for shooting whenever and wherever you can't come up close to your subject. Actually, there are no absolute rules for the use of these lenses. The questions of how high a shutter speed is necessary and how long a lens can be hand-held depend on the individual using it, as well as the specific lens itself. Generally, professionals are hand-holding lenses as long as 300mm or 400mm; and although they are practiced in keeping the camera steady, they always shoot at as high a shutter speed as possible. *Life* photographer Paul Schutzer made this photograph of folk singer Mahalia Jackson during a prayer pilgrimage to Lincoln Memorial in Washington. With a 180mm f/2.8 Sonnar lens on a Praktiflex single-lens reflex, Schutzer shot at 1/250, f/5.6 on Plus-X Pan.



WEST COAST PHOTOGRAPHER DON WORTH SELECTS SUBJECTS FROM NATURE, USES TECHNICAL CONTROLS IN SHOOTING AND IN THE DARKROOM TO PRODUCE IMAGES OF BOLD DESIGN AND MONUMENTAL SIMPLICITY. FOR COMPLETE TECHNICAL DETAILS AND BIOGRAPHICAL INFORMATION, SEE TEXT ON PAGE 124.

Succulent plant, California. 4 x 5 Crown Graphic camera, 135mm f/4.7 Optar lens, Kodak Tri-X film pack developed in a Pyro developer (development extended to increase contrast), one-half second at an aperture of f/32.

Dead trees, Sierra Nevada mountains. 4 x 5 Crown Graphic, 135mm f/4.7 Optar lens, Kodak Super-XX film pack developed by time and temperature in Kodak DK-50 (68° for five minutes), red filter, 1/25 second at f/11.

DISCOVERY #52



FAIRS? FIREWORKS? CARNIVALS? AMUSEMENT PARKS? BOARDWALKS? SHOOT'EM AT NIGHT

Norman Rothschild, *MODERN's* color columnist, is that phenomenon among technical experts, an incurable amateur. If it's a new material or piece of equipment, he'll use it as the manufacturer has intended and then he'll explore every variation known to mankind and a few extras he's thought up for himself. This quest for new methods is apparently endless. Inevitably, Rothschild will appear across the desk, his eyes sparkling as he pours out more innovations on a subject that has become a closed issue for the less imaginative. For such a photographer, there are no false rigidities of rules. There may be failures, but only the chance-taker fails. And many times, there are new ways of seeing which stimulate the amateur to more picture taking and more fun from his hobby. The intriguing aspect of this way of thinking about pictures is that either the sky or your own environment is the limit as far as subject matter is concerned. You can take a dozen pictures of one subject and each can be entirely different from the other. With a lot of imagination and a limited amount of equipment the local county fair can become as exotic as far Mandalay. And, if you don't like the colors you see—or even the shapes of the subjects—you can vary them to suit your own whim. From Rothschild's thousands of color slides, we have chosen three to show what a ready eye and a quick trigger finger can accomplish when shooting at night. One picture was taken at a local amusement park, a second at a street fair, and only the third was taken in a faraway place—Mexico—on a recent vacation trip. On *page 77* are ten tips from Rothschild on how you can get more fun out of your own night color photography. A word of caution: shoot with a light heart, leave the serious mind at home with your daily troubles and care. And take along lots of film.—J. B.

NOT ENOUGH COLOR IN THE SUBJECT? CHANGE IT & ITS SHAPE: HERE'S HOW

An amusement park is for fun—and letting off steam. Let this be the cue to your picture approach when you've taken the family off for an indigestible outing. Sometimes the spectacularly lit rides are more pictorial when shot from a distance against the black night sky. Rothschild was intrigued by the moving light streak pattern possibilities of a revolving ride at Palisades Amusement Park (*opposite*), but the light was white and formed a stark pattern. He changed the color to green by placing a Kodak X2 yellowish-green filter in the filter slide holder in front of the lens and exposed for two seconds (on Kodacolor) for the ride at $f/4.5$ with his Hasselblad 1000F and 80mm $f/2.8$ Tessar lens. He hand-held the exposure, bracing himself against a building wall. He then softened the pattern by shooting a second exposure on the same frame: a group of lights from a bandstand. They started their picture life as white, round images, but Rothschild changed the color by using a Kodak 32 magenta gelatin filter, changed the shape by placing a star shaped diaphragm also in the filter holder and shooting out of focus. (If he had shot in focus the point source of illumination would have retained its round shape.) He made the diaphragm himself out of an old piece of paper backing for roll film. You can make any shape you wish—diamond, star, heart, etc. All you have to do is make sure that the cutout is no larger than the diameter of the lens opening, which can be measured with a ruler when the lens is set at its widest aperture and the shutter is on time or bulb. The exposure for the bandstand lights was $f/2.8$ at $1/2$ sec. Rothschild figured a basic exposure for Kodacolor (E.I. 32) of $f/2.8$, $1/10$ sec., divided by a filter factor of 4.





UNPREPARED FOR UNEXPECTED ACTION? TAKE A CHANCE AND SHOOT IT ANYHOW

In Oaxaca, Mexico, Rothschild watched the celebration in honor of the Virgin of Soledad. He had his Exakta VXIIa, 55mm f/1.9 Steinheil Auto-Quinon lens, loaded with High Speed Ektachrome, Daylight Type. (He frankly admits he pulled a boner in taking only daylight film with him, as he thought he wouldn't be doing any night shooting. But he then adds that he shoots at night with daylight film anyhow. For reasons, see box, right.) His camera was set at f/4 and 1/5 sec. and focused on the crowd when suddenly a fantastic figure of a dancing man, bedecked in shooting pinwheels, appeared. (The man, called a "toro" since he is dressed as a bull, was wearing an asbestos suit. Rothschild, who was not so lucky, was burned on the leg.) With no time to refocus or figure a new exposure as the fireworks would soon die away, Rothschild followed the man and made this intriguing once-in-a-lifetime, take-a-chance shot.

IS THE SCENE TOO STILL FOR DRAMA? FILL THE FRAME WITH BRIGHT COLOR

The calm, considered, classic photographer has his moments at fairs and carnivals, too. For there are subjects that aren't shooting off fireworks, or moving too fast for anyone but an odds player like Nick the Greek to chance an exposure. Such a scene is this one of giant balloons, with flags and lights at the Festival of San Gennaro in New York City's Greenwich Village. The trick in this case was to fill the frame with as much brilliant color as possible and to try for the sharpest image. Rothschild was using a Leica M3, 50mm f/2 Summicron lens, High Speed Ektachrome, Type B, no filter. First he walked around the balloons, looking for the best angle for lighting, then with his Weston III meter, he was able to take a reading off the balloons. (If you can't get that close, take a reading from your hand in approximately the same kind of light as your subject and open the lens one f-number.) He exposed f/2 at 1/10 second.

NIGHT SHOTS GIVE YOU TECHNICAL TRAUMAS? ANALYST ROTHSCHILD'S 10 TIPS WILL HELP

TRIPODS: You really should use one, but I have found excellent substitutes. The backs of sober friends, sides of buildings, tables, food counters, upside-down garbage cans.

FILMS: I suggest the fastest available (such as High Speed Ektachrome or Super Anscochrome), but don't ask your processor to push it. You'll be taking a chance on color shifts and increased grain. Negative color films are great all around as the color balance can be corrected for your prints or transparencies. I sometimes use daylight films at night because I think the warm reddish cast can add a lot to a picture. It's also the correct choice for shooting people under fluorescents. (For filter corrections for all films, all kinds of lighting, see MODERN, August 1960.)

EXPOSURE: For the high speed color films my experience has taught me to use a basic exposure of f/2.8 at 1/10 sec. At times I may shoot at 1/60 sec. as this underexposure deepens the colors. Then I usually bracket, shooting one stop under and one-stop over. This is just if I can't take a meter reading because the subject is too far away or the unexpected happens.

FILTERS: Ordinarily don't use them for people, but like to use strong ones for changing colors to suit my fancy.

FRAMING: You usually can't do too much cropping, so I try to fill the frame as much as possible with my subject.

ACTION: Don't worry about blurs, sometimes they are more effective than stopping the subject cold, and you can't expect to stop everything anyhow.

LENSES: The most important factor is speed. The faster the lens, the higher the usable shutter speed. I sometimes change lenses when making double exposures, to get two image sizes from the same camera position.

ANGLE: Many a good picture is lost by people who insist on staying in the same place after their first shot. Walk around. Notice the relationship of objects to each other, go up in a ferris wheel, shoot from your knees, stand on a chair. Try it from all sides and heights.

FIREWORKS: Place the camera on a tripod, set lens at infinity, shooting on bulb, open the lens, close before the burst in the sky starts to drop. I usually shoot f/5.6 on medium speed (E.I. 32) color film, f/8 or f/11 for the higher speed (E.I. 100 or 160) films.

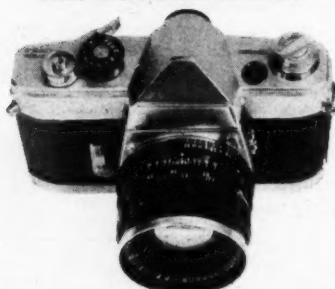
FUN DEVICES: I use a gelatin filter holder which fits over the front of the lens. I can change colors by using gelatin filters of various hues and saturation. These are cheaper and easier to slip in and out of the holder quickly than the glass filters. You can also change shapes by using diffraction grating, various shaped diaphragms, diffusion discs to produce rings of color. Keep the exposure short and shoot the source of illumination out of focus or else it will remain round. By the way, I recommend either a single or twin-lens reflex for this kind of shooting, as you can see exactly the effect you are after. For twin-lens reflex users: remember to place cut-out over viewing lens to see effect, change it to taking lens before exposure.

MODERN TESTS

NEWEST CAMERAS • LATEST FILMS • IMPORTANT ACCESSORIES

MODERN PHOTOGRAPHY'S exclusive monthly equipment report section devoted to informative, unbiased field tests of equipment submitted to and passed as acceptable by our technical department.

35MM MINOLTA SR-1, IMPROVED REFLEX



Manufacturer's Specifications: Minolta SR-1 35mm single-lens eye-level reflex. Lens: 55mm f/2 Auto Rokkor with stops to f/22 and helical focusing to 18 in. Shutter: Focal-plane with speeds from 1 to 1/500 sec., B, X, FP sync. Viewing: Eye-level prism reflex with ground-glass center surrounded by fine Fresnel screen. Other features: Instant-return mirror; automatic diaphragm; automatic zero-resetting frame counter; rapid wind and rewind cranks; accepts same bayonet mount lenses, viewing attachments, and all accessories made for the SR-2 camera. Price: \$169.50. Importer: Minolta Cameras, 150 Broadway, New York 38, N.Y.

Anyone for an improved version of a good camera at a lower price? That's just about the situation with the Minolta SR-1. It looks, feels, and works just like the SR-2, but some of the

kinks which irked photographers about the older model have been eliminated and in the course of redesign, a better camera has evolved.

As you may recall, we reported in the May 1959 MODERN ("Modern Tests," page 90) that "The Minolta SR-2 is one of the most advanced, well engineered, and handsomely designed new cameras in the top quality 35mm field." And now, we have the SR-1 with improvements such as: quieter and smoother working shutter and release, a shutter-speed selector you turn to set instead of lifting up and dropping into place and half-stop aperture positions from f/2 to f/5.6. Many photographers complained that the take-up spool in the SR-2 cut small chips of film off the roll which remained inside the camera. When we first used the SR-1 we discovered that the small catch in the take-up spool which caused this trouble is no longer in existence. We also found that it wasn't necessary at all, since film is pulled through the camera by the sprocket wheel instead of the take-up spool. (Incidentally, if you already own an SR-2, take out the take-up spool clip by removing a screw and squeeze the protruding piece of metal with pliers. Place the clip back and you're in business with an improved SR-2.)

Since the SR-1 is almost identical to the SR-2 in such features as camera body design and construction, automatic diaphragm, instant-return mirror, film wind and rewind, we shall not discuss how they work since this is already done in detail.

The changes incorporated in the SR-1 which resulted in a price drop of about \$80 were undoubtedly the switch from an f/1.8 to an f/2 Auto Rokkor lens, and a reduction of the 1/1000 sec. maximum shutter speed to 1/500 sec. To some gadget-loving camera fans, these changes might seem disastrous. However, for those who are more interested in the final

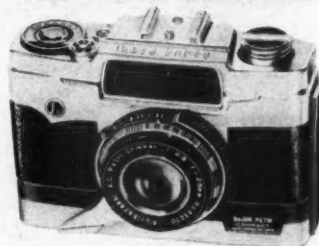
picture result, since these changes have resulted in a sizable price reduction, the saving might be used to buy an additional lens or two.

However, all is not gold. Comparison tests show that the SR-1's viewing system is not as bright, corner to corner, as the system incorporated in the SR-2. The Minolta people made the newer camera's focusing screen finer (the Fresnel screen is not as pronounced), and so light distribution to the corners of the screen has been cut down.

Our tests made with the 55mm f/2 Auto Rokkor indicated that at f/2 sharpness was good with little sharpness fall-off at the edges. At f/5.6 sharpness was excellent with little fall-off at the edges. Overall sharpness decreased slightly at smaller apertures.

Obviously the newer 55mm f/2 Auto Rokkor will be compared with the f/1.8 Auto Rokkor (reported on in "Modern Tests," May 1959). There we stated that "The 55mm f/1.8 Rokkor lens was exceedingly sharp at full aperture, even at the edges, and reached its greatest overall sharpness at a point between f/5.6 and f/8." As our tests imply, the f/1.8 Rokkor proved slightly superior to the f/2 Rokkor at widest aperture. However, optimum quality was achieved at approximately the same aperture with both lenses, and these results were equally excellent.—E.M.

HALVING THE 35MM: THE PETRI COMPACT



Manufacturer's Specifications: Petri Compact single-frame 35mm camera. Lens: 28mm f/2.8 Petri Orikkor. Shutter: Petri Carperu-S with speeds from 1/15 to 1/250 sec., X sync. Focusing: Manual focusing from 2.25 ft. to inf. Other features: Bright-line picture frame with parallax markings, bottom rapid-wind lever, folding rewind handle, auto resetting frame counter. Price: \$34.95, with leather slipcase. Importer: DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.

Haven't had so much fun with a camera in a long time. The Petri Compact

is truly pocketable (go and name a current double-frame 35 that is) and a delight to use, particularly if you like to relax from serious picture taking and bang away at snapshotting. With the relatively short focal-length lens, a comfortable shape to hold, a hair trigger release and a rapid-wind lever which is just about the best and handiest we've ever used, you can run up a series of 72 single-frame ($\frac{3}{4} \times 1$ -in.) shots in about 60 seconds if you have a mind to. You will only run into trouble when shooting close—at from two to three feet—using large apertures, where estimating your depth of field is not only difficult but impossible. Why did the manufacturer put a depth-of-field scale in the instruction book but none on the camera?

For general subjects at six feet or more, it's hard to make a mistake in setting distances sufficiently accurate for the 28mm lens.

The view through the finder is exceptionally bright. You will become accustomed to the vertical bright frame when the camera is horizontal and a horizontal frame when you hold the camera vertically.

We were delighted with the tiny shots. Since we're veteran 35mm photographers, we found that handling the film presents no problems—it's just the same as in full size 35mm cameras. Will processors mount single-frame transparencies? A quick check by MODERN indicated that a number of large labs are beginning to do just that. And these tiny cameras loaded with Kodachrome should be a real money saver for the penny pinchers among us.

The Petri Compact is extremely well made yet quite light. Controls work easily. Our lens tests showed that at all apertures the 28mm Petri Orikkor produced acceptable sharpness with moderate sharpness fall-off at the edges—excellent for any snapshot camera.

The manufacturer is completely in error when he states that you get 72 shots. Made between 78 and 80 myself.—H.K.

TAMRON 400MM TELES FOR 35MM REFLEXES

Manufacturer's Specifications: 400mm Tamron f/6.9 or f/7.5 telephoto lens for most focal-plane shutter single-lens 35mm reflexes. **Features:** Diaphragm (f/6.9 preset) to f/32, focus 30 ft. to infinity. **Price:** \$84.95 for f/6.9; \$69.95 for f/7.5. **Importer:** Photographic Importing & Distributing Corp., 67 Forest Rd., Valley Stream, N. Y.

What with the family of single-lens reflexes multiplying in rabbit fashion, it's not surprising to see lens makers turning to optics that show the reflex off to best advantage. Best advantage means long lenses, and long lenses are generally heavy in weight and price. By limiting the maximum opening to f/6.9 or f/7.5 and employing an optical construction used generally for telescope design and not for cameras, we have here two of the shortest (12 in.), lightest (24 oz.) and best constructed lenses we've seen. While a tripod socket is built into a ring on the f/6.9 mount, anyone not suffering from the ague should be able to handhold either Tamron at 1/125 sec. The focusing mounts are very legibly engraved in white on the black satin barrel. The front cell of both lenses turns 180° during focusing. The preset diaphragm is convenient to use on the f/6.9 and did not slip during our test. Besides lacking a tripod socket, the less expensive f/7.5 Tamron has no preset diaphragm and is slightly more Spartan in construction here and there.

Following the trend in long lenses the Tamron has various camera body adapters available at \$5.95 each which thread into the camera end of the lens. Change camera bodies and change adapters. We tested the Tamron and learned that the optical quality of the less expensive lens was equal to the performance of far more expensive 400mm lenses and was far superior to the f/6.9. Used on various single-lens reflexes, the f/7.5 proved good at full aperture with some corner fall-off, and very good between f/11 and f/16, again with some corner fall-off. There was a slight decrease in sharpness at smaller apertures. The f/6.9 was acceptable at full aperture. At f/11 to f/16 apertures it produced results similar to the f/7.5.

The f/7.5 Tamron produced less vignetting than the more expensive model. On a Pentax-Pentacorn mount, the f/7.5 produced no vignetting at all and just a small amount of vignetting in an Exakta mount. The f/6.9, however, produced considerable vignetting in the corners at all apertures.—H.K.

PRISM BRINGS ROLLEI TO EYE-LEVEL VIEW

Manufacturer's Specifications: Eye-level prism finder for all Rolleiflexes. **Price:** \$69.50. **Importer:** Burleigh Brooks, Inc., 420 Grand Avenue, Englewood, N. J.

This is the eye-level pentaprism for which $2\frac{1}{4} \times 2\frac{1}{4}$ camera owners have

been waiting. It is excellent. The lucky late-model Rollei owners, whose cameras feature a removable hood, can slip the prism in place in seconds. Through it, they can see a nearly life-size (1:1.3 image magnification), brilliant and sharp-to-the-corners focusing and viewing image which compares quite favorably with the best pentaprisms built for 35mm reflex cameras.



The prism is remarkably light (1 lb. 2 oz.) considering the large picture area it must cover. It is relatively compact and the extremely rigid scuff-proof black metal housing is finished with typical Rollei craftsmanship. There are only two slight faults. First, the prism produces an amount of pin-cushion viewing distortion—the edges of the picture area seem to curve inwards. This, we felt to be extremely unimportant. Secondly, even with the deep, flexible rubber eyecup removed so you can get your eye closer to the eyepiece, some eyeglass wearers reported difficulty in seeing the edges of the picture frame. Non eyeglass wearers found the eyecup essential in eliminating stray glare and reflections.

Using the eye-level finder atop a Rolleiflex 3.5E, we literally rediscovered the camera. It became a completely different camera to handle. The eye-level image was extremely easy to focus. The unreversed image makes it an ideal instrument for shooting action. (The ground glass on all twin-lens reflexes has reversed left-to-right images.) Every movement, every nuance or change in a subject's expression could be clearly seen and focused within the prism. Since this was a twin-lens reflex camera with a fixed mirror we could watch the pentaprism image up to, during and after the shutter was released. (There is one thing better than an instant-return mirror and that's a mirror that doesn't move at all.) Although the Rollei itself has been designed almost exclusively for waist-level operation, it performs competently and balances well at eye level. Like the best 35mm eye-level

(Continued on page 80)

MODERN TESTS

(Continued from page 79)

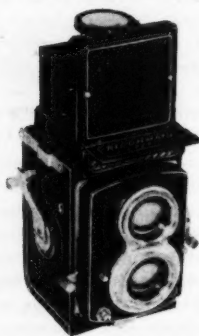
COMING IN MODERN

Can't find what month we tested your favorite camera? A complete index, listing every piece of equipment that has ever been evaluated in "Modern Tests," will be published in a forthcoming issue.

cameras, you can follow focus and shoot without ever removing the prism from your eye to advance the film.

Rollei technicians insist the new prism is designed for, and can only fit the new Rollei models featuring an interchangeable focusing hood. We imagine, however that the repairman who first adapts the prism to older model Rolleis and other $2\frac{1}{4} \times 2\frac{1}{4}$ reflex cameras will receive more than a gold medal.—H.K.

RICOHMATIC 225 FOR $2\frac{1}{4}$ AND 35



Manufacturer's Specifications: Ricohmatic 225 $2\frac{1}{4} \times 2\frac{1}{4}$ twin-lens reflex with conversion kit for 35mm. Lenses: 80mm f/3.5 Riken viewing and taking. Shutter: Seikosha SLV with speeds from 1 to 1/500 sec. plus B, MX sync, self timer. Other features: Single-stroke film-advance and shutter-cocking crank; built-in exposure meter; duo-lever focusing; sports-finder and critical focusing magnifier. Price: With 35mm conversion kit, \$99.95. Importer: Riken Optical Industries Ltd., 521 Fifth Ave., New York 17, N.Y.

Here's another addition to the small band of $2\frac{1}{4}$ -cum-35 cameras, which

also incorporates several improvements over previous Ricoh twin-lens reflexes.

The Ricohmatic 225 is roughly similar in build to the Diacord L. One big difference is that the built-in exposure meter has been moved to the left-hand side, leaving the right-hand side free for a combined film-advance and shutter-cocking crank. This makes the Ricohmatic 225 one of the few under \$100 twin-lens reflexes to feature both built-in exposure meter and rapid advance crank.

The combined film advance and shutter cocking crank provides double exposure prevention (provision is made for deliberate double exposure). There's another safety device on the Ricohmatic 225—the shutter release will not operate unless the viewing hood is open.

The duo-lever focusing allows for easy operation by both hands. There are similar but smaller levers on either side of the lens mount for aperture and shutter-speed setting (the markings are visible in a window on top of the viewing lens). The shutter release, on the front of the camera near the bottom, lies conveniently under the right forefinger when the right thumb is on the focusing lever.

In using the camera, we found the viewing image acceptably bright except in direct sunlight, when we had to cup a hand around the hood to keep out extraneous light (a common occurrence with waist-level reflexes).

The exposure meter, which reads only in EVS numbers, gave excellent results in all but the lowest light conditions. At E.I. 400 the lowest reading gave us a setting of f/4 at 1/30 sec. However, the small range of the meter dial makes accurate low-light readings difficult if not impossible with high speed films.

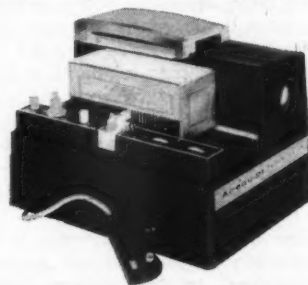
Our lens test showed that at f/3.5 sharpness was good with some fall-off at the edges. Sharpness was very good at f/5.6 with some fall-off. At the smaller apertures there was a slight decrease in overall sharpness.

The 35mm accessory gear took us some time to adjust, but no doubt we would have speeded up with practice. In shooting with 35mm film, you have to press a special release after each exposure, which allows the film to be advanced. It is essential not to press this release at any other time, or the film will jam. With the camera in its

normal position, 35mm exposures will be vertical; the accessory sports-finder makes it possible to take horizontals without too much difficulty.—W.H.J.

AIREQUIPT'S FIRST SLIDE PROJECTOR

Editor's Note: In July "Modern Tests" we ran a report on the equipment below, based, unknown by us, on a pre-production model. Since results differed so markedly in the production model, we print a test re-run below.



Manufacturer's Specifications: Superba 77 automatic 2 x 2 slide projector. Lens: 4-in. f/3.5 Luminac. Lamp: 500-watt. Operation: Automatic, semi-automatic and manual. Other features: Remote control, similar controls on body; 2- to 30-sec. automatic slide interval timer; down-draft anti-popping cooling system; editing slot; permanently stored power cord; sound sync provision; automatic lens shield which positions when cover is replaced. Price: \$119.95. Manufacturer: Airequipt Manufacturing Co. Inc., 20 Jones St., New Rochelle, N. Y.

After specializing for years in making automatic changer magazines for countless projector manufacturers, Airequipt has decided to put out their own, featuring focusing, advance and reverse operation by remote control.

Naturally the extremely compact ($10\frac{1}{4} \times 7\frac{3}{4} \times 7\frac{3}{8}$ -in.), light (11 lbs.) Superba 77 is built around the extremely compact (5-in. long) all-aluminum Airequipt slide tray, which holds 36 cardboard-mounted or thin-glass-mounted slides in metal holders. (Binders using the standard thick glass will not fit.) You can turn an Airequipt slide magazine upside down deliberately and, guess what? The slides do not rain on the floor. The magazine loads into the back track of the 77. Now where is that connecting cord to plug in the projector? Right underneath the machine, coiled neatly in its own niche with the projector end permanently attached. In an adjacent hollow rests the 12-ft. cord of the remote control unit.

Plug in the Superba 77 and the

very quiet fan goes on automatically; flip the lamp switch on the projector proper, press the slide magazine against the operating lever and you're on your way. Press one of the buttons on the remote control unit and the first slide slips into place. Not in focus? Push the second button on the remote control unit forward. The lens will move forward a small increment. Push it for as many increments as needed to hit sharp focus. To make the lens move in the opposite direction, press the button backwards. To reverse the magazine operation, push the first button in all the way and the slide magazine will reverse its direction. Of course all this can be done directly at the projector too, and there are elevation and level controls plus a timer control which will automatically advance the slides at intervals of 2 to 30 seconds.

In our tests we found the projector worked faultlessly as long as you are careful to slip the magazine into the track properly. No slide jammed, but we were grateful for the easy way the condensers could be removed for cleaning and for slide unjamming if it should happen. In tests a few hidden features became evident. When you put the metal cover on the projector, a protective slide cover automatically falls over the lens. This slide moves out of the way when you remove the cover.

Did you ever go nearly blind staring at the brilliantly lit slideless white screen after the last slide is shown? No possibility with the Superba 77. When the magazine is finished a dark slide shields the direct rays of the bulb from hitting the screen.

Lens tests indicated that the image was sharp and illumination perfectly even from center to edges when projecting a 35mm slide. There was some corner fall-off of light when a super-slide was shown.

We tested the anti-popping claims of the Airequipt Superba 77 rather thoroughly. After all, if slides don't pop out of focus when they heat up why do you need a remote control focusing unit? Slides did pop unless the projector was warmed up for from 5 to 10 minutes before the slide show. After warming up, slides did not pop at all and the projector itself stayed amazingly cool. However, variations in the cardboard mounts did make focusing necessary, as they do in any slide projector. Usually, one increment adjustment was all that was needed. The increment adjustment system proved quite popular with everyone trying the unit, since it was virtually impossible to overrun exact focus. And the increments are small enough so

you can hit exact focus—it doesn't fall between increments.

The 77 also features an editing arrangement allowing you to remove and replace individual slides without removing the magazine from the projector. Further, it has provision for showing cardboard mounted frames without the Airequipt holders.

This is one of the best designed and constructed pieces of photographic equipment we have seen.—H.K.

KODAK MICRODOL-X FINE-GRAIN DEVELOPER

Manufacturer's Specifications: Kodak Microdol-X fine-grain developer. **Features:** Produces low graininess coupled with maximum sharpness of image detail; relatively short development times with most films; produces very low fog level even with extended development times; also produces slightly brownish image which increases actual print contrast. **Price:** In powder form only, qt., \$.85; gal., \$1.65. **Replenisher,** qt., \$.85; gal., \$1.65. **Manufacturer:** Eastman Kodak Company, Rochester 4, New York.

Comparison tests made with Tri-X Pan Improved type and Plus-X Pan film, developed in Microdol-X, D-76, and Microdol developer, showed the following in enlargements of 50 diameters (equivalent to making a 50 x 75 in. print).

Films processed in Microdol-X had sharper looking grain than when processed in Microdol, but less pronounced than when processed in D-76 developer. They had better edge sharpness than when processed in Microdol, but less pronounced than when processed in D-76. They had finer looking grain than when processed in D-76, but not as fine as when processed in Microdol. The films could be exposed at normal exposure indexes without loss of quality.

We found that by using Tri-X Pan Improved type film at E.I. 400, normal developing times at 68F with the usual intermittent agitation vary from about 9 to 14 minutes depending upon the contrast of light you shoot in. On bright sunny days we found our best development time to be about 9 minutes. On negatives shot on flatly lighted days (overcast, rainy) the 14-minute time increased the contrast enough to yield a normal printing negative. With Plus-X Pan the times ranged in the same manner from 8 to 11 minutes depending upon the lighting.

Further tests were made with Micro-

dol-X diluted 1 part developer to 3 parts water (1:3). Kodak claims that if you dilute Microdol-X 1:3 and increase the developing time about 30 to 50 percent, you'll get better image sharpness than with stock Microdol-X developer. In our 50-diameter enlargements only a very slight increase of sharpness could be seen between film developed in the stock developer and the diluted developer. The advantage perhaps is a saving in dollars if you use it diluted, since it will go four times as far, unless, of course, you use the stock developer and replenish it religiously. Then you simply use the developer and add the correct quantity of replenisher until it's depleted.—E.M.

REFLEX SHOT: REFRESHING DEPARTURE



Manufacturer's Specifications: "Reflex Shot" Camera Rickinghan. **Lens:** 40mm-long single-element, with identical viewing lens. **Shutter:** manually operated. **Other features:** China body with black and gold finish, black plastic carrying strap. **Price:** \$0.59 (reduced from \$0.98). **Manufacturer:** Relco, Japan. **Importer:** Woolworth's (importation now discontinued).

We tried the Reflex Shot with Scotch, rye, bourbon, and gin, and found that it gave excellent results in even the dimmest light. Operation is unbelievably simple: all you do to get loaded is remove either lens or viewing lens, or both, pull out shutter, and tilt camera smartly over lens or lenses. There is only one aperture, but this is adequate for all purposes.

The only serious problem we encountered was with focusing, which became almost impossible in the later stages of our test. We also noticed a certain unsteadiness in the diaphragm. All in all, however, the Reflex Shot was a pure pleasure to handle, and we cannot bear to be parted from it.

MONTHLY CONTEST

Send
Your
Best Shots
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Win \$25!

Good exposure is a matter of selection

SOMETIMES IT'S EASY to decide which part of your subject you should expose for, if the highlight-shadow ratio is greater than the film can record. At other times, you may instinctively expose for what you think is the most important part—and thereby take a dull picture. This doesn't mean that you should strive after offbeat effects—the picture *below* isn't offbeat, yet it depends on exposure for the water, not the human figures. The pictures *opposite* show other considered choices from a range of possible exposures.

Anyone may enter any number of black-and-white prints in MODERN's "Monthly Contest." Pictures must be 4 x 5 or larger. Polaroid prints may be submitted in original size. Your name, address, and all technical data must appear on the back of each print. No entry blanks are required. *Please enclose a stamped (first-class postage), self-addressed envelope* if you want us to return pictures we're unable to use. Send them to Columns Editor, MODERN PHOTOGRAPHY, 33 W. 60 St., New York 23, N. Y.



OVERALL exposure reading brings out texture of water (note luminous effect of sunlight through wave), makes dramatic near-silhouettes of figures. Clarence Mac

Maki, Honolulu, Hawaii, used a Rolleiflex (protected from spray by a lucite box) and a medium yellow filter, exposed at f/5.6 and 1/125 sec. on Kodak Tri-X Pan.



◁ **COMPROMISE** was necessary to show sufficient detail in these contrasty subjects. Herr Friedel, Munich, Germany, used a Rolleiflex, exposed for moderate shadow detail at $f/5.6$ and $1/100$ sec. on Perutz Perpantic film.

SILHOUETTE (*below left*)—made by exposing for sky—turns the intricate structure of a ferris wheel into a striking design. Lotte Laska, Cologne, Germany, used a Rolleicord, exposed at $f/11$ and $1/125$ sec. on Agfa Isopan F.

FOREGROUND exposure—for grays of cat—overexposed light background and blocked shadow detail in dog's head, stressing its relative size. Julie Hogan, New York City, used Rolleiflex, $f/5.6$ and $1/125$ sec. on Kodak Tri-X Pan. ▽



CHAOS IN FITTING FILTERS

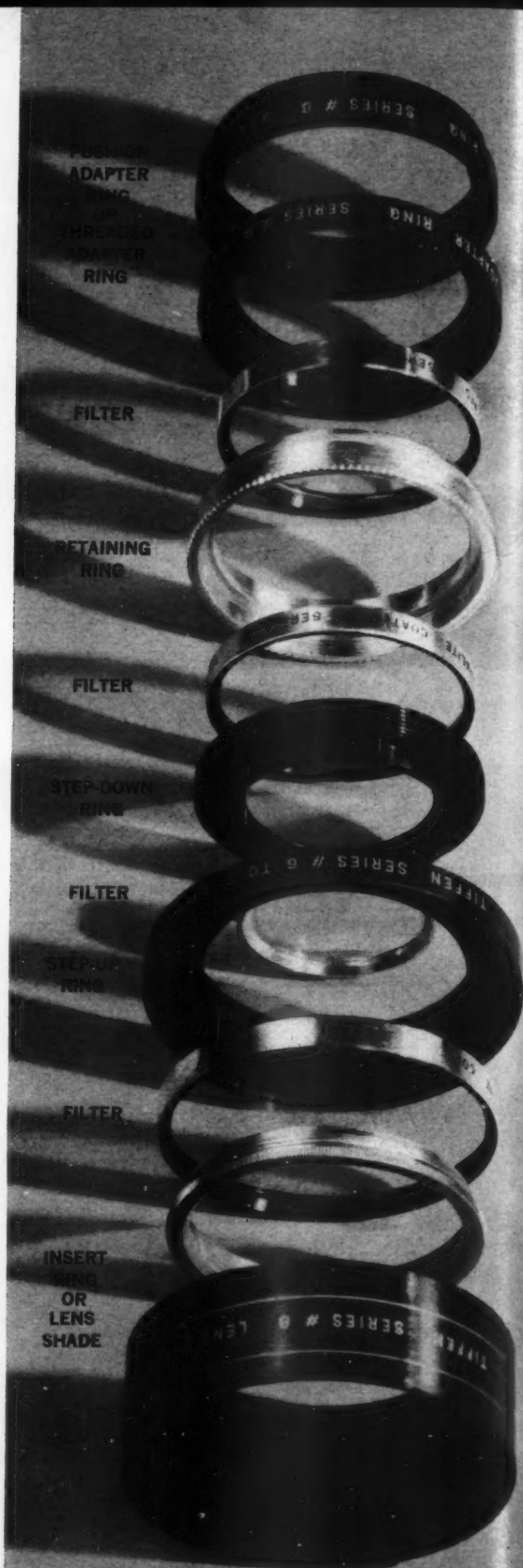
MODERN DISSECTS THE VARIOUS SYSTEMS AND DISCUSSES THE PROS AND CONS OF EACH ONE

Technical Research by Norman Rothschild

FILTERS AND FILTER ADAPTERS are necessary evils. Besides the minute but inevitable loss of quality caused by any additional piece of glass in front of your lens, there is the problem of fastening it there so it won't fall off, won't impair the picture, and can be easily removed after you're finished.

In years past, these were the only considerations for anyone with one camera and one lens. With the later swing to more than one camera or more than one lens, problems have been compounded. The owner of camera Number 2 or lens Number 2 doesn't feel in the least like shelling out for a second complete set of filters, adapters, close-up lenses, lens shades, etc. But will the original set fit camera or lens Number 2? And perhaps even more important, will picture quality be affected? Most discussions center around the filters themselves—how good is the optical quality, will the filter alter the sharpness of the picture itself? Do filters vary from one manufacturer to another? We'll take these up in the near future.

This however, is the story of filter adapters—of adapter rings which don't quite fit the thread of your lens mount, of retaining rings that refuse to unscrew from the adapter rings, of step-down rings which also step down the picture quality, of lens shades which shade the viewfinder but not the lens. First we'll examine the almost universal lens accessory system—the Series System. We'll take a look at the new Lifa System, based on the Series, but offering distinct improvements. We'll list a few other systems that are available. We'll explain what all the filter terms are, and we'll attempt to list the pitfalls and booby traps that the unwary may slip into. Since we must live with filters, we might just as well make the best of it.



◁ THE SERIES SYSTEM—ORDER AT A PRICE:

If the average camera store attempted to stock a filter size for every lens diameter made, there wouldn't be any room for cameras. The Series System keeps the chaos down to a minimum. Filters and close-up lenses are made in only six different diameters (the smallest, 16.5mm, is labeled Series IV and the largest, 77mm, Series IX), but each series includes many adapter rings, designed to fit a wide variety of lenses. The proper Series recommendation for your camera or lens is based on the smallest diameter filter that will perform correctly in front of your lens. The filter, however, is simply a plain or metal-rimmed glass disc. It fits into any of the adapter rings in its Series, and the appropriate ring screws or pushes directly into or onto the front of your lens. An aluminum alloy retaining ring threads into the adapter ring, keeping the filter in place. Instead of a retaining ring, you can also thread a lens shade, a double-threaded retaining ring which allows you to add a second filter, or a step-up or step-down ring which permits you to use filters which are larger (step-up) or smaller (step-down) than that specified for your camera. **Advantage:** practically any number of cameras of varying lens diameters and manufacturer can be fitted with a single set of lens accessories, provided you base your filter choice on the Series proper for your largest diameter lens. **Disadvantages:** adapter and retaining rings are often difficult to unthread, threads even from the same manufacturer are sometimes irregular. Too many lens accessories, or a step-down, may cause vignetting.

LIFA SYSTEM—SERIES PLUS EFFICIENCY: In the Lifa system (right) the filters themselves are not plain-rimmed. Each has a nylon rim with a bayonet mount on each side. The adapter ring, which is made of stainless steel, instead of aluminum alloy, threads into the camera lens mount. The nylon-rimmed filter bayonets directly into the adapter and needs no retaining ring to hold it in place. Since there are bayonet threads on both sides of the rim, other filters or a plastic lens shade can be fastened directly to the filter with no need of a double-threaded retaining ring. **Advantages:** two or three of these filters take up the same amount of space as one Series filter. You can bayonet about six together and carry them in a neat, small case formed partly with the lens shade. There's no danger of cross-threading, as they are made exclusively for each other. If you drop the filters, they'll probably bounce, with lots less chance of breaking. Step-up rings are available. **Disadvantages:** the adapter ring accepts Lifa items only, although Lifa filters will fit most Series size rings. ▷

ADAPTER
RING

FILTER

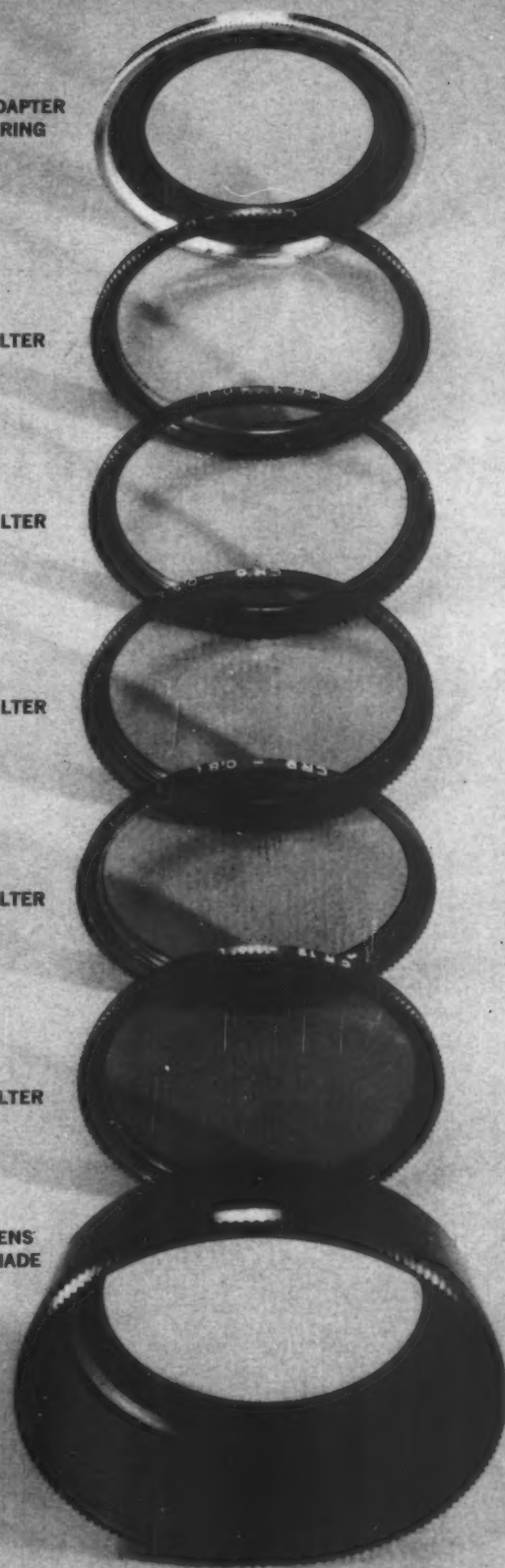
FILTER

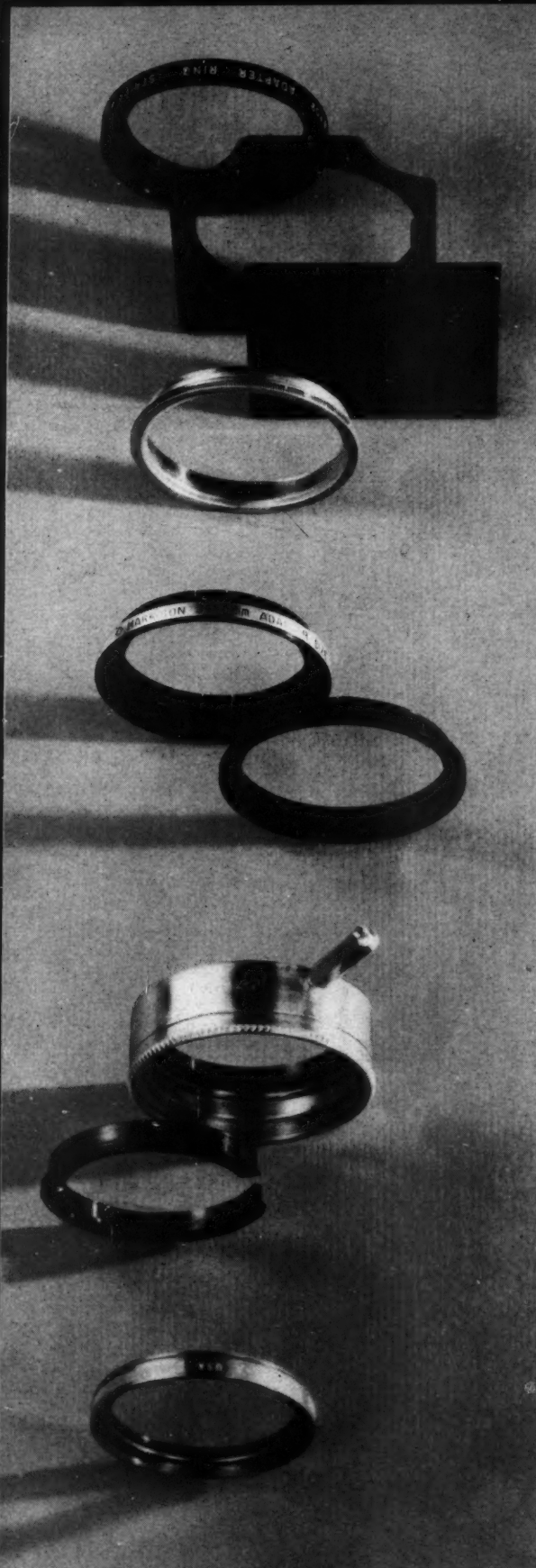
FILTER

FILTER

FILTER

LENS
SHADE





GELATIN FILTER HOLDERS: For the hound who plans on using many different filters, one way out of the adapter ring jungle is the gelatin filter—a square piece of thin gelatin, available in more colors than glass filters. Since any fingerprints or foreign substance, except very light dust, cannot be removed from the filters once they settle on the surface, you need special holders to handle the filters. The square filter, in 2-in. (Series VI), 3-in. (Series VIII) or 4-in. (Series IX) sizes, is slipped into a square metal frame (same size)—the Gelatin Filter Frame—which fits into a Filter Frame Holder. One side of the holder has a round hole so that it can fit between an adapter and retaining ring. **Advantages:** cheaper than glass filters. Several filters will fit into one frame, eliminating extra accessories. **Disadvantages:** they must be handled very carefully to prevent scratching, etc.

COMBINATION ADAPTER RING: Most threaded adapter rings fit one lens diameter only. Harrison's 900 Series Adapter Ring has a regular threaded mount which is slit about 20 times, producing prongs like the regular push-on mount adapter rings. The prongs can be bent about 1mm in either direction to adjust the threads for the inside of most lens mounts having the same diameter and slightly larger or smaller threads. **Advantages:** allows you to use one filter for many lenses with a 2 to 3mm range of diameters. **Disadvantages:** most of those of the Series System (see page 85).

SET-SCREW ADAPTER RING: Instead of pushing on or in, or threading into the lens, this Enteco Adapter Ring, slightly larger than the outside diameter of your lens, is held over it by the pressure of an external screw whose handle juts out from the side. Two split plastic inserts are supplied, to be fitted inside the ring for lenses whose diameter is too small for the adapter ring alone. **Advantages:** accepts Series size filters and accessories, and fits on any lens whose diameter is within a 5mm range. **Disadvantages:** the screw will scratch the lens mount if the plastic insert is not used.

SCREW-IN FILTER: Some filters have rims which are threaded so they can screw directly into a lens with a similar thread and diameter. Many camera and lens manufacturers supply such for their own products. Filters may accept a threaded or push-on lens shade. **Advantages:** a permanent, safe way of mounting if you use one filter only. **Disadvantages:** unless you're using lenses with the same thread, you'll need a separate set of screw-in filters for each lens.

WHAT'S WHAT IN FILTERESE? YOU CAN'T TELL THE PLAYERS WITHOUT A PROGRAM

ADAPTER—also called adapter ring or filter adapter. Holds filter, close-up lens, or similar accessory on camera lens. See below.

ADAPTER, BAYONET—twists, with quarter turn, onto cameras having bayonet lens mounts. Most twin-lens reflex cameras have this kind of mount.

ADAPTER, PUSH-ON—a series of adjustable metal prongs or fingers which hold adapter on lens mount by friction.

ADAPTER, SCREW-IN—screws into inner threads of lens mount. Also has female thread on other side which accepts retaining ring or other accessories.

ADAPTER, SET-SCREW—fastens to outer edge of lens mount by means of a set or clamping screw.

DISC—a flat, circular piece of glass. Usually refers to unmounted filter or close-up lens.

FILTER—a colored disc, or sheet of gelatin, placed, by means of an adapter, in front of the camera lens to obtain a desired photographic effect. Different colored filters produce different effects (e.g. yellow filter darkens blue sky, makes clouds stand out).

FILTER, GELATIN—a thin square piece of colored gelatin used instead of glass filter disc. Requires special kind of adapters (see Gelatin Filter Frame and Gelatin Filter Frame Holder).

FILTER, SCREW-IN—has own thread built into rim. Screws directly into lens without need for adapters or retaining rings.

FILTER, SERIES—disc manufactured in one of six standard diameters, used with accessories of same series, except for adapter ring which is individually made to fit a particular lens (within a certain range of about 10mm).

FRAME, GELATIN FILTER—a two-piece square metal frame with hole cut out in center, designed to hold gelatin filter flat. One piece has two grooves on edges to hold filter. This piece slides into the grooves of the frame.

HOLDER, GELATIN FILTER FRAME—a square metal frame with three deep grooves along edges for holding Gelatin Filter Frame. One side is blank, the other side has a hole cut out in center for an adapter ring and insert ring.

LENS, CLOSE-UP—also called plus lens. A clear glass disc, resembling a filter disc and usually the same size. It is actually a weak magnifier and is used for close-up photography.

RING, ADAPTER—see Adapter.

RING, INSERT—has male thread which screws into female thread of adapter ring or retaining ring, used to hold filter or close-up lens in place.

RING, RETAINING—holds filter in place in adapter and has recessed pocket for a second filter, close-up lens, etc. On one side there is a male thread which screws into adapter or another retaining ring. Other side has female thread for retaining ring, insert ring, lens shade, etc.

RING, SERIES ADAPTER—adapter ring, with individual thread or other mount for a particular lens, which accepts filters and other accessories of the same series.

RING, STEP-DOWN—permits use of filter from next smaller Series. Screws into adapter of one Series (e.g. VI). Has recessed pocket and female thread for filter and retaining ring of smaller Series (in the above case, V).

RING, STEP-UP—permits use of filter of next larger Series. Screws into adapter of one Series (e.g. VI). Has recessed pocket and female thread for filter and retaining ring of larger Series (in the above case, VII).

SHADE, LENS—prevents extraneous light from hitting surface of lens and causing unwanted reflections. Has thread, or other type, mount for particular lens. Usually in the form of a truncated cone, but may be square or rectangular.

KEEPING OUT OF THE BOTTOMLESS FILTER PIT

1. For the best fit, use the filter adapters made by the manufacturer of the camera or lens.
2. To prevent aluminum alloy retaining rings from getting stuck in adapter rings, coat the threads with a small amount of vaseline or graphite (rub a pencil point over the surfaces).
3. Avoid pressure on the filter due to screwing the retaining rings in too tightly. Stop turning as soon as the ring is fully seated.
4. Never use step-down rings unless it's an absolute emergency. If you can't avoid it, run a test to see if the smaller filter is cutting off part of the picture frame. Small lens shades are particularly liable to cut off the image.
5. In close-up work especially, avoid unintentional out-of-focus pictures by focusing on the subject with the filter already in place on the camera.
6. Don't force threaded rings, shades, etc. either on or off another threaded item. Take them to a repair shop.
7. Don't use a filter or threaded ring that **almost** fits another lens. Forcing will eventually wear out the lens threads. Get a new one instead.
8. Take your camera, lens, etc. to the store when buying filters or accessories, to insure the right fit. Sometimes threads from the same manufacturer are irregular.
9. Don't use too many accessories at the same time. If you must use a lot of items, choose as large a size as you can, to avoid image cut-off.
10. Too many accessories can cause a shift in the focus of the image to a plane other than that of the film plane, thus producing an unsharp picture. Limit yourself to two, or in an emergency three, filters or close-up lenses.

FLOWER MOVIES NEED A STORY

MAKING A FLOWER MOVIE can be a visual adventure, both in shooting and projection. First, as you look through your viewfinder, you'll be able to see close-ups of flowers without interference from surrounding objects. Then, when you project the footage you shot, you'll see even more nuances of color, form, and texture that only the greatly magnified image can make apparent.

But there's a danger in concentrating entirely on shooting close-ups of flowers. Flashed on screen one after the other, images of flowers, no matter how strikingly detailed or technically good, can be boring. After a while one flower begins to look very much like another.

You can accent the beauty of flowers in your garden, window box or field and at the same time make a more interesting movie by building a story line. As you develop your story, the camera techniques you'll need will become apparent.

Let's talk about story first. Keep it simple and your film will be more effective and easier to shoot. Important too, a simple script makes it easier for other people to take part—as in the story outlined by the photographs on these two pages. This script can be shot right at home—with any member of the family playing the supporting role. And it can be done on as little as 25 ft. of double- (Continued on page 130)



USE LIGHT FOR MOOD:

Starting film with the sunrise helps set the mood and pace of your film. Here a series of single-frame exposures can be made as sun starts peeking over horizon. When film is projected sun rises on screen in one uninterrupted movement. Space single frames about 20 to 30 seconds apart and shoot about 64 frames for 4 sec. screen time (at 16 fps). Exposure reading should be taken from sky and checked throughout shooting. Unusual effect can be achieved by cutting to a backlit close-up of flowers. Take reading for both backlight (sun) and flowers. Then, start shooting with lens set for backlight reading. As camera runs, open lens to exposure setting determined for flowers. Projected footage will show flowers changing from silhouette to image showing detail and color.



FILM TIME-LAPSE: By using the single-frame control of your camera you can show a flower growing from bud to blossom. The mood and pace of the sequence matches the opening shot. First determine total time required for flower to blossom. Then, determine how long you want shot to take on screen. For example, if it takes four hours (240 min.) for flower to bloom and you want 10 seconds of actual screen time (at 16 fps), divide 160 into 240. The result is 1 frame must be exposed every 1 min. 30 sec. If you shoot outdoors keep checking light conditions, changing diaphragm opening whenever necessary to keep good exposure throughout. The sequence can be made indoors as well, using photofloods. That way, exposure will be consistent and require no change during entire shooting period. Keep background simple. A few branches or stems can be used against a black background to match garden conditions. However, keep background far enough away from the lens to be out of focus.

ADD PEOPLE: Scenes that show only flowers tend to be boring. However, you can add a change of pace and interest by introducing people. Start shooting the scene with only the garden visible. Then, have your subject walk into the frame from either the right or left. This long shot is held until the person walks to the foreground and kneels at the flower bed. Follow with medium shot and change angle. It's important here that you should not keep the character in a static position. Have her smell a flower or perform some other movement. Then cut to close-up. Shot should last only as long as action is interesting.



SHOOT CLOSE-UPS: Long shots of flowers should be used only to establish a scene. If you really want exciting footage move in close. Previous scenes have already established presence of variety of blossoms. Now, cut to extreme close-ups of each variety. Keep shots brief, and change angle. We use a low angle in first shot, left, then switch to a high one that lets the audience look right into the flowers themselves. A lap dissolve, overlapping shots with one scene fading out as the other fades in, can be used effectively to make several cuts flow together. The final shot in sequence shows someone cutting flowers in preparation for making an arrangement. This too, can be repeated several times, employing several types of flowers. Intercut close-up of flowers being placed in basket one at a time. See "Movie Maker," page 30, for information on correcting for parallax when shooting extreme close-ups.

CHANGE BACKGROUND: Logical change of scene helps to add action, too. However, change must be one audience can follow. Moving indoors for flower arrangement makes sense. Shooting near window on sunny day helps match lighting to outdoors, but scene can also be filmed indoors on indoor type color film using photofloods, bounced off ceiling and walls. Again, use series of long shots, medium shots, and close-ups to help pace of film. Plan each scene in relation to the one before and the one after it. Have a logical beginning and ending as in last illustration. Final scene of flower arrangement can be filmed with direct light concentrated on flowers, with background somewhat dark to dramatize effect. End movie with slow fade-out of flowers.

THE BIG BROUHAHA

PFA EXHIBIT 2 OPENS AT THE METROPOLITAN; IS IT BETTER THAN LAST YEAR'S SHOW WAS?

On May 20, 1960, *Photography in the Fine Arts, Exhibit 2*, opened at the Metropolitan Museum of Art in New York City. *PFA 2* in some respects is definitely an improvement over last year's controversial first show.

It has more pictures—176 rather than 85. It is better displayed—the previous show was jammed into one dimly lit room; this year several spacious well-lit galleries on the second floor have been used. The pictures are well hung—in groups of similar subject matter and at different levels; some on walls; others on waist-high slanted tables. The print quality of the black-and-whites is much superior to last year's. Much of the color is very good in print quality although a few are libels of the originals.

As a matter of fact, almost anything that could be done physically to improve

the show has been done. But little has been done to improve the level of what is being passed off on a photographically unknowing public under the name of "fine art photography."

Certainly the show is a pleasant one and leaves the viewer with a sense of well-being and comfortableness. Like most photo shows *PFA 2* has some excellent photographs; some bad ones; some that are merely inoffensive. But whether *PFA 2* will convince anyone that, on the basis of what is being shown, photographs may now be considered on an equal plane and with the same degree of seriousness as painting, sculpture, etc., is very much to be doubted. And this, after all, is the whole point of the *Photography in the Fine Arts* project, organized by Ivan Dmitri under the aegis of the *Saturday Review*.

The results aren't surprising considering the odd way in which the 16-man jury (consisting largely of non-photographic experts—museum print

curators, book publishers, advertising agency art directors, art critics, etc.)—judged the 800 final photographs in but one day. The judges were specifically asked *not to look for great photographs*. According to the charge to the jury: "Each is to vote according to his own esthetic responses, not because he thinks it *should* be voted for, nor for its being great art. Vote only as you like or dislike a picture."

Astonishingly enough, this charge ended with a statement which seems a puzzling contradiction to the above quotation: "Our jury, made up entirely of museum directors, curators, and art critics, has brought its talents to photography and now we hope that the photographer will aim his talents more directly toward art."

Nor was it possible for the individual creative artist to submit what in his judgment was his best work directly to the jury. Unless his pictures were nominated or screened by an intervening panel, he could not submit to *PFA 2*. Even if the photographer is taking pictures only for their worth as photographs, his highest purpose (as that of every artist) is to communicate his feelings and vision. This year he couldn't even communicate with the jury.

There have been screams of pain from many concerning the very make-up of the jury. The defenders of the art-jury concept say that art-oriented jurors will be more objective than photographers (who may make invidious comparisons of their personal styles and orientation); but not every photographer is that impossibly subjective and intolerant. Further, there are picture editors, photographic historians, critics, and curators who would bring to such a jury the ability to weed out the copies or derivations, who could spot the fresh and new approaches, who could judge from a knowledgeable frame of reference.

The fact that several of the photographs in *PFA2* are derivatives of styles and photographs established by other photographers many years ago could thus have been avoided. Would a painting be hung in the Metropolitan if it were a skillful copy of the style and subject matter of Picasso's "Blue Period"?

A plus mark is due the organizers for the representation of photojournalism and magazine illustration-pictures taken for publication. A second plus for the 15 percent of amateur work. But big fat zeroes for the lack of representation of the scientific, the experimental, the individual who takes photographs for their own sake and isn't an organization man—Siskind, Strand, Weston.

Finally, if *PFA* is an attempt to show a selection of the *best* photographs that have been taken, a high level could have been maintained. Even though
(Continued on page 128)

WERE STEICHEN'S CRITICISMS OF PFA VALID? HOW DID DMITRI ANSWER THEM?

On Feb. 8, 1960, Edward Steichen, Director, The Department of Photography of the Museum of Modern Art, wrote a letter to Ivan Dmitri, Director of Photography in the Fine Arts, which explained his attitude toward the project and his reasons for withdrawing from the jury on which he had served for the 1959 show.

Herewith, Steichen's letter, and Dmitri's reply:

"Dear Mr. Dmitri:

"After the manner in which I expressed myself at the January, 1959 meeting held in your studio, and in view of all that has followed, it should not surprise you to learn that I have no interest whatever in being connected with the continuation of your *Photography in the Fine Arts* project. My principal reason for this is that in my estimation the whole undertaking is the most damaging thing that has ever happened to the art of photography.

"Your pretense that this venture

would initiate the collecting of photographs by art museums, and persuade them to consider photography as an art, may, on the whole, have been due to ignorance. For instance, you may have been unaware that some European art museums acquired photographs during the latter part of the 19th Century (as a matter of fact I sold prints to art museums in Brussels and Hamburg over fifty years ago). You may not know that the Boston Museum of Fine Arts has a small collection of photographs; that The Art Institute of Chicago has a Department of Photography and an excellent collection of prints; that The Metropolitan Museum of Art has an aggregation of early photographs second to none; that the museum in Indianapolis has a Department of Photography and that—to name only a few—the Buffalo and San Francisco Museums have small collections of prints.

"You may have been oblivious of these facts, and consequently failed to recognize the fallacy of your position as the Sir Galahad of photography, but, being a New Yorker you surely must have known that
The (Continued on page 128)

BASIC BOOK OF

MODERN COLOR PHOTOGRAPHY

PART ONE

For the first time, fully illustrated, the fascinating story of color — why we see it, how the film records it, the differences between color pictures and the original scenes — is presented in concise book form written exclusively for MODERN PHOTOGRAPHY by two experts, Hollis Todd and David A. Engdahl, professor and assistant professor in the School of Photography of the Rochester Institute of Technology. Don't miss MODERN next month for the concluding chapters.

**LIGHT: ITS
CHARACTER IS
HARD TO
PIN DOWN**

Light is the basic ingredient necessary for photography. Most photographic equipment and material has been developed to produce, to measure, to control, to modify light and to record more or less permanently the images formed by it.

Let's clearly establish our definition of "light." It's that form of energy capable of affecting our eyes and thus producing vision. We're ruling out "invisible" light or "black" light. There are such unseen forms of energy as infrared and ultraviolet, but these, and some others, we're not including in our concept of light.

The exact nature of light isn't clearly known. Sometimes light seems to be a stream of particles; other times it seems to act like a wave, e.g. water or sound waves. Unfortunately, despite intense effort, scientists have not been able to weave these opposing behaviors into a single theory. However, most aspects of light are explainable by the wave theory, and we'll use this.

Light is a form of energy that can be produced only from some other form of energy. The simplest and perhaps the most useful way of producing it is from heat. You can do this by warming an object to a sufficiently high temperature using a direct flame. In Fig. 1 (all the illustrations referred to by numbers will be found on the color pages) an iron nail, a nickel coin, and a copper coin are getting just this treatment. Note that these three different solids behave in the same way. In a fairly cool flame they glow, producing a reddish light. In a hotter flame, they produce a much more brilliant, nearly white light. The color of the light varies with the temperature.

When we heat, in a similar flame, substances which vaporize and become gases, the situation is changed. Each substance produces an entirely different color of light, and the temperature of the flame has little effect on the color of light produced.

Here then are the two types of light sources as used in photography. Household bulbs and photofloods, as well as flashbulbs using metal filaments, produce a light whose color is completely dependent on the temperature of the filament. Arc lamps, electronic flash tubes, neon and fluorescent tubes all make use of vapors as light sources, and give off various colors depending upon the kind of vapor they contain.

Obviously you can use temperature as a reliable guide to the color of light only when you're dealing with lamps having a solid filament. For practical purposes, we may assign a color temperature to other sources based solely on the *appearance* of the light. The value we assign, however, may have little or no relation to the real nature of the light. For example, although the sun gives light resembling that from a solid, outdoor light is so modified by absorption and scattering in the atmosphere that color temperature is applied to daylight only with caution; such designations may have little value.

If you want to know more about the light produced by a lamp either with a metal filament or gas, you must go beyond simply looking at the results shown in Fig. 1. Most lamps produce a mixture of different colors of light, but you do not see these different colors because they are indistinguishable to your eyes. However, instruments have been developed which sort out such a mixture of light into its different *colors*, making it possible to examine (and to measure) them separately. Such instruments consist of a narrow slit aperture, which receives the light to be examined, and a prism (or the equivalent) which spreads out the light into a varicolored band—a *spectrum*. (A rainbow is a spectrum of sunlight formed by raindrops.) The spectrum may be allowed to fall on a screen, or it may be viewed through a magnifier, or it may be allowed to fall on a photographic film.

**Here's how sunlight,
photofloods, elec-
tronic flash differ**

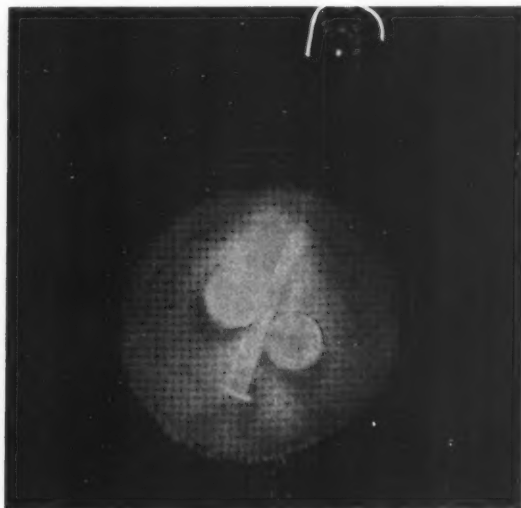
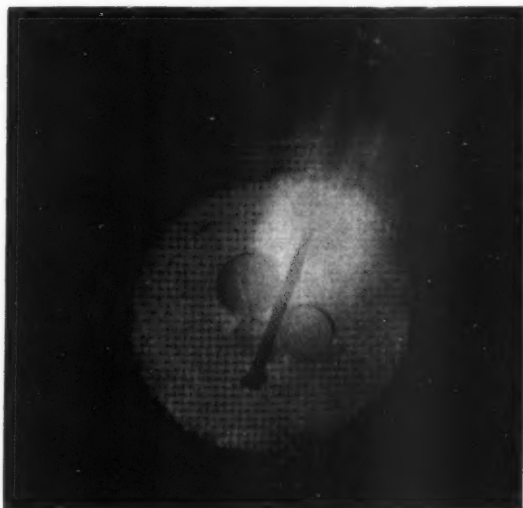


Fig. 1. HOW HEAT AND LIGHT ARE RELATED: An iron nail, nickel coin and copper coin glow with a reddish light when a fairly cool flame is applied (left). However, in a hotter flame (right) they produce a much more brilliant, white light. The tungsten filament in household lamps and photofloods reacts in just this manner. By measuring the temperature of such light sources we can determine their color. Gases, such as the xenon in electronic flash tubes, however, react quite differently under the same circumstances. They remain the same color no matter how much temperature is applied. They change color only if the ingredients of the gas are altered. While we assign a color temperature to gases for practical purposes, you can see that it can lead to errors since the temperature has very little relation to the real nature of the gas.



Fig. 2. WHAT'S IN THE LIGHT? Light from a heated solid forms continuous spectrum when divided by glass prism (left). All light wave lengths are present here. Heated gas, however, would form a discontinuous spectrum of one or more lines separated by dark spaces.

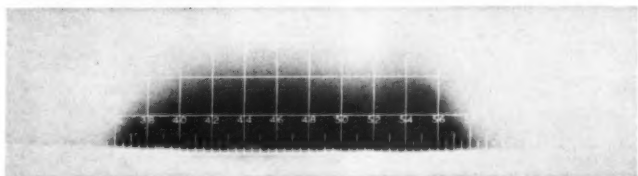


Fig. 3. CAN IT BE MEASURED? Height of image in wedge spectrogram on black-and-white film is great in blue region, absent in red, when compared to Fig. 2. If the color sensitivity of the film is known, we can measure the nature of the light source.



Fig. 4. BETTER IN COLOR? Problem of accurately charting intensities of light in spectrum by measuring the height still depends on knowing response of film. Even if it's known, all you can estimate is that light was rich in red, poor in blue.

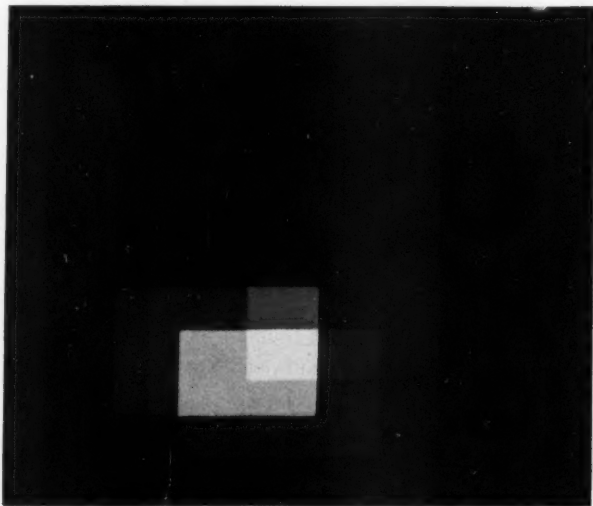


Fig. 5. ADDITIVE COLOR: In additive processes, different colors are produced by mixing red, green and blue light. Here they are projected on a screen. Red and green produce yellow; red and blue produce magenta, green and blue make cyan. Proper mixture of red, green, blue produces white light. Where no light strikes the screen, black area appears.

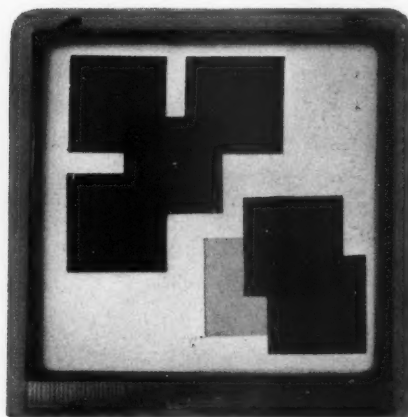


Fig. 6. SUBTRACTIVE COLOR: In subtractive processes, different colors are produced by overlapping colored substances, here filters. White is produced with no filters; black by red and green, or blue and green, or magenta and green, or cyan, magenta, and yellow.

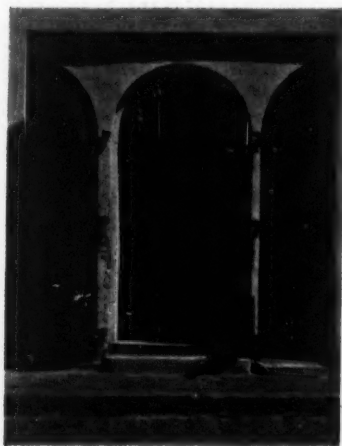


Fig. 7. UNDEREXPOSURE: When you make an error and underexpose color more than $\frac{1}{2}$ stop, the quality of the resulting transparency will definitely suffer. The result will be too dark; light tones will be muddy.

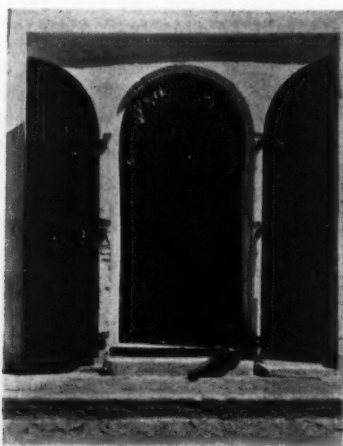
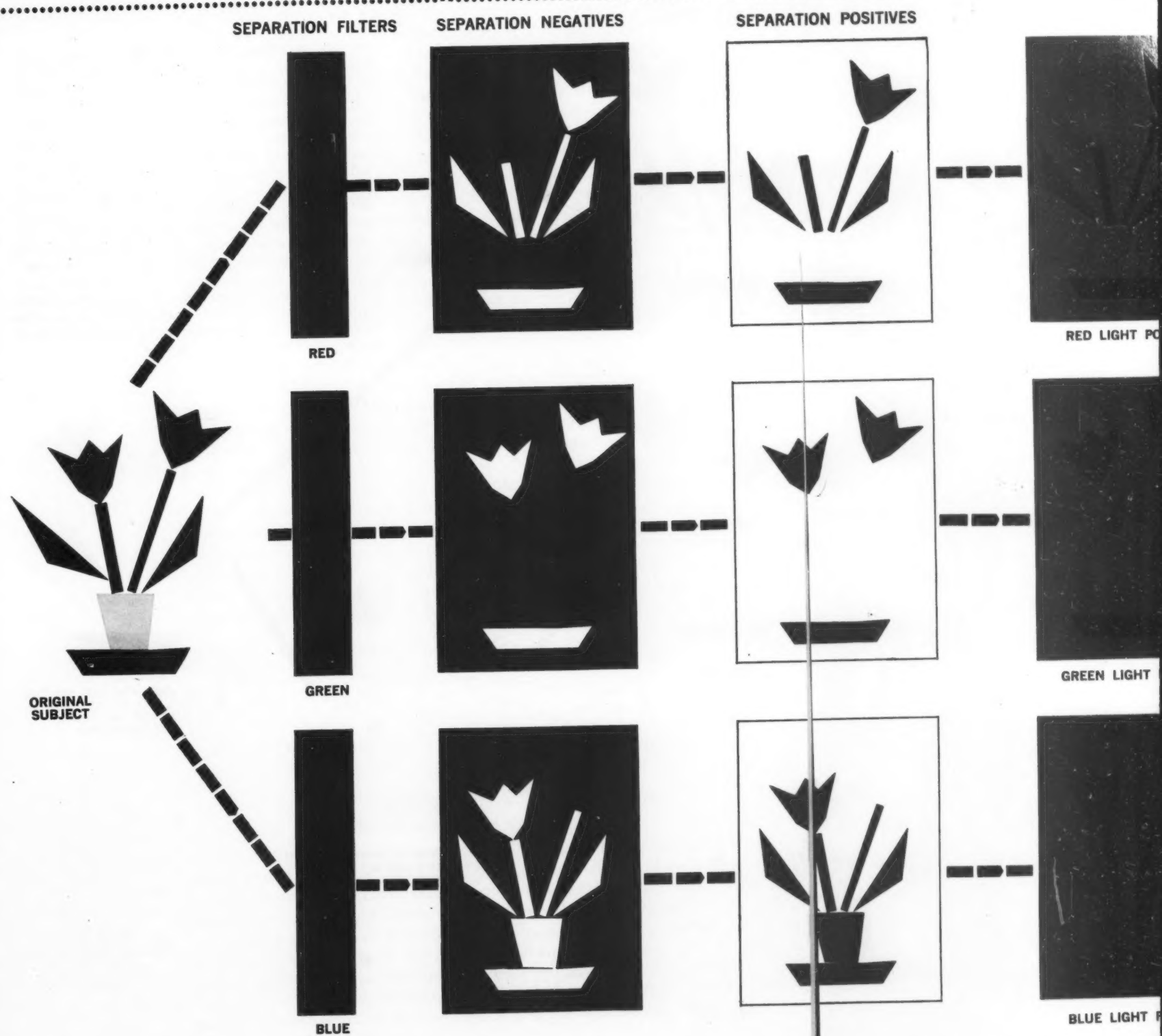


Fig. 8. CORRECT EXPOSURE: A good transparency has highlights recorded as thin areas but with adequate detail. Blocked up shadow areas as in doorway don't indicate improper exposure but film's limited latitude.



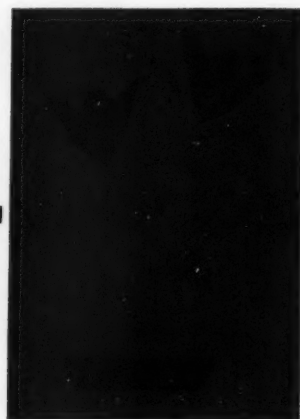
Fig. 9. OVEREXPOSURE: When you make an error in the opposite direction to Fig. 7, and give more than $\frac{1}{2}$ stop too much exposure, the entire transparency will be too light. Light tones will wash out completely.



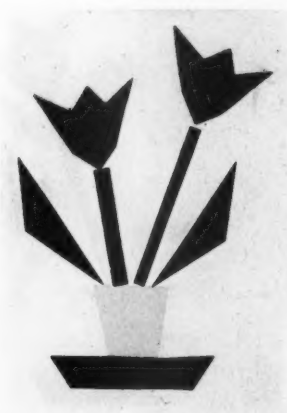
ATION POSITIVES



RED LIGHT POSITIVE



GREEN LIGHT POSITIVE



POSITIVE RED, GREEN AND
BLUE LIGHT IMAGES SUPER-
IMPOSED ON WHITE SCREEN



BLUE LIGHT POSITIVE



Fig. 10. ADDITIVE COLOR:
Subject was photographed
through red, green, then
blue filter on 3 pieces of
film. These are separation
neg. From each a separa-
tion positive was produced.
With 3 separate projectors
to project red, green and
blue light positives atop
one another, the original
scene is reproduced.



SEPARATION FILTERS

SEPARATION NEGATIVES



ORIGINAL SUBJECT



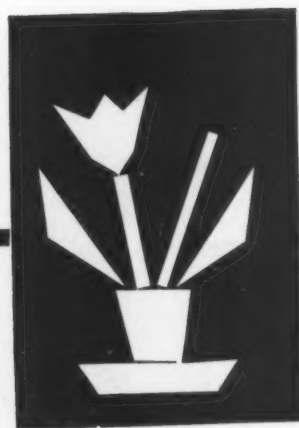
RED



GREEN



BLUE



TERS SEPARATION NEGATIVES



DYE POSITIVES

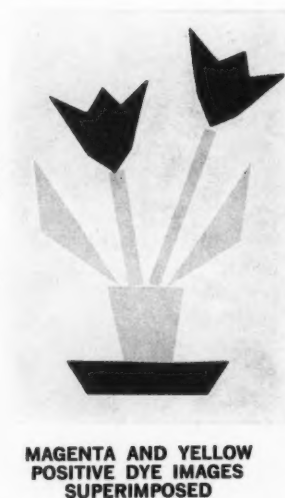
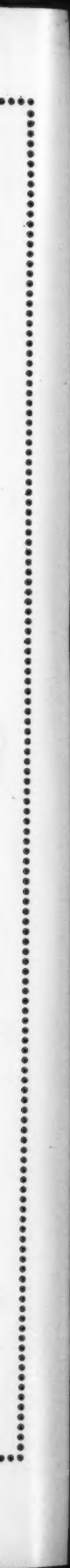


Fig. 11. SUBTRACTIVE PROCESS: Unlike the additive process, which uses silver positives to transmit the right amounts of red, green and blue light, here we use three dye images instead. This allows us to place the three dye images atop each other in register, forming a tripack. We can project this combination of cyan, magenta and yellow images act as light valves, letting just so much red, green and blue light pass. When we register cyan, magenta and yellow images physically together and view them by projected white light, we have a subtractive color process. Most of our modern transparency films—Kodachrome, Anscochrome, Ektachrome—are based on the subtractive process. Of course these films incorporate the separation filtering system directly into the film.



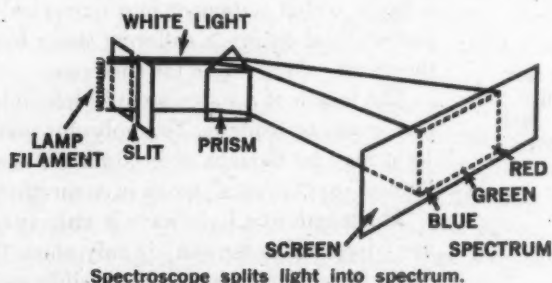
Light from a gas source may produce no picture at all!

If light from any solid heated to a suitable temperature is examined with such an instrument, the spectrum is found to be *continuous*; that is, completely filled with a series of colors ranging from blue through green to red (Fig. 2). There are no gaps. When light from a heated vapor is similarly viewed, an entirely different kind of spectrum is seen: it consists of only one line or a few lines of light, separated by dark spaces. Exactly what lines are seen in the spectrum depends upon what the vapor is. For example, if vaporized common salt is used as the light source, its spectrum consists only of a single color of light—yellow; no red or green or blue is found at all.

Here is how this can affect you, the photographer. Suppose you're photographing a blue object, which characteristically reflects only blue light well. If using a photoflood, which produces light from a solid tungsten filament, you know that the lamp is producing some blue light at least, and that with sufficient exposure the blue object will be properly recorded on the film. However, if you were to use instead a vapor light source, you might very well have no blue light at all. *No exposure of any amount would form an image of the blue object.* Fortunately, the xenon gas vapor used in electronic flash produces many well-spaced lines throughout the spectrum.

We can also measure the *amounts* of light found in various parts of the spectrum by adding to the spectroscope described above some device which can respond *correctly* to different colors of light. By "correctly" we mean that the recording device must give the true value of the light present, regardless of its color. This isn't easy, since many measuring instruments respond better to one color of light than another and produce misleading data. For instance, photoelectric cells are generally unsuitable because their response varies considerably according to the different colors of light.

Very often a photographic emulsion is used to record and measure the intensities of a spectrum. To do this, an optical wedge is usually positioned between the light source and the film (which occupies the position of the screen *below*). An optical wedge is a partly transparent piece of glass which varies in its absorption of light from one edge to the other. If this wedge is placed in



front of the film, only the strongest part of the spectrum can penetrate the darker part of the wedge to affect the film. If the darkest edge of the wedge is uppermost, the height of the image of the spectrum produced by the film indicates the strength of the different colors of light *as they affect the film*.

Photographic materials however, do not respond equally to equal amounts of different colors of light. All photographic emulsions show a very great response to blue light, as compared with their response to green or red light. Even "panchromatic" materials vary in this manner, often requiring only a tenth or a hundredth as much blue light to give the same response as with a given amount of red light.

Because of this non-uniform sensitivity of the film, such a record (called

Film can be to blame since it does not respond equally to all colors

It's easier to talk
of colors in
wave lengths than
use fuzzy terms

a wedge spectrogram) cannot by itself give a direct measurement of the intensity of different colors of light. Fig. 3 is a reproduction of a sample wedge spectrogram. The height of the image is greater in the blue region of the spectrum; this higher response *may* be because intense blue light was received by the film. It could, however, mean simply that the film is very sensitive to blue light, and that there was in reality not very much blue light present. The wedge spectrogram shows no response at all to red light. Perhaps this means that red light was absent, but the same result could have been produced with a great deal of red light, if the film used had a very low sensitivity to red.

Fig. 4 shows a sample wedge spectrogram made on color film. Here the total response is greater to the red light present than to the green or blue light. Only if you are told that this film gives equal response to a particular source can you know something about the light used in making this record. Even with this information, all you can know is that this light was relatively rich in red light and relatively poor in blue light.

A wedge spectrogram is of use in studying the sensitivity of a film only if you know the nature of the light that was used in making the record; some other device is needed to measure that light first.

What we need for this purpose is, to repeat, some receptor of light which responds equally to equal amounts of any color. Our recording device must be *black* because a black object by definition is one that absorbs equally (and almost wholly) all colors of light. Such devices exist. Perhaps the most commonly used is a blackened thermocouple, which is basically a very sensitive thermometer. When this is placed into various parts of a spectrum, it warms up because it absorbs the light and converts it back to heat; this temperature rise, recorded on a meter, indicates accurately the strength of the light that is present. When this arrangement is incorporated into a spectroscope, the device is now termed a "spectrometer," which means "spectrum-measurer."

We now have a suitable apparatus for measuring the intensities of light in different parts of a spectrum. It is convenient to have a means of indicating, also by numbers, the position within the spectrum. It is awkward, for instance, to speak of a spectral color as "a kind of reddish-orange." To translate such a fuzzy verbal statement into numerical terms, we consider light as a wave motion, and assign a different *wave length* to each different position (and therefore color) within the spectrum.

The length of a water wave is definable as the distance between two successive crests or troughs. To apply this concept to light, you must suppose that light may be thought of in a similar manner, though it is hard to say what "crests" or "troughs" mean in connection with light.

The length of a light wave is unimaginably small: the longest wave we can see (deep red to the eye) is only about three hundred-thousandths of an inch long: the shortest wave in the visible spectrum is a little over half as long as the longest. Since the length of a light wave, if measured in inches or centimeters, is such an awkward decimal number, new units of measurement have been devised.

1. The micron, symbol μ (the Greek letter "mu"), is one millionth of a meter. In this unit, light waves range in length from about 0.4 to 0.7 μ .

2. The millimicron, symbol $m\mu$, is one-thousandth of a micron, or one-billionth of a meter. In this unit, light waves range in length from about 400 to 700 $m\mu$. This is the most frequently used unit for the measurement of wave lengths of light.

We customarily think of the visible spectrum as being divided into nearly equal thirds, each third about 100 $m\mu$ wide. The shortest waves look blue,

**Yellow light? You'd
hardly be missing
a thing if it
didn't exist**

from 400 to 500 $m\mu$; the middle section of the spectrum, from 500 to 600 $m\mu$, contains the greens; and the remainder, from 600 to 700 $m\mu$, includes the longest, red, waves. In Fig. 2, where the visible spectrum is shown, the wave lengths are expressed in tens of millimicrons, that is, 40 means 400 $m\mu$. We shall hereafter refer to the visible spectrum in terms of these blue, green and red divisions. This color description is not very exact. There is much variation of color within each section, and the sections blend into each other without a clear boundary. Nevertheless, this subdivision is very useful.

Notice, incidentally, that the yellow portion of the spectrum is practically insignificant. As a matter of fact, nothing would be fundamentally changed in color photography if the yellow part of the visible spectrum were missing altogether, as we'll see later.

When a spectrometer is used to make measurements of, for example, the light from an ordinary tungsten bulb, it records some energy in regions lying adjacent to, but beyond the visible spectrum. In fact, for this lamp the highest reading on the meter would lie rather far outside what you see as the red region of the visible spectrum. This is the infrared region of the spectrum, composed of waves longer than any you can see. Similarly, on the other side of the visible spectrum, beyond the blue (or violet) region, a spectrometer records ultraviolet energy, composed of waves too short for your eyes to respond to.

Infrared energy is produced by most sources, but is not too important in color photography, since most color materials are very insensitive to it. Color films and papers are, however, very sensitive indeed to ultraviolet energy, and respond to it as if it were blue light. The presence of excessive amounts of ultraviolet energy may cause you to get color pictures of unexpectedly poor quality, unless you realize this situation. Ultraviolet absorbing filters are often useful in reducing the overall blue color cast seen in high-altitude color photography, where much ultraviolet is usually present. Similar filters are required in color printing, even though very little ultraviolet is produced by the lamp.

The information secured by a color spectrometer is best charted in the form of a graph. Such a graph displays the *spectral energy distribution* of the source; this method is also customarily used to show the kind of light reflected from colored objects.

It is not generally necessary to show the exact quantity of light produced by the source at each different wave length; it is usually enough if only the *relative* energy is indicated, because this alone determines the color of the source. (If the color of the source is correct for the film you are using, your regular light meter can tell you how much light you have.)

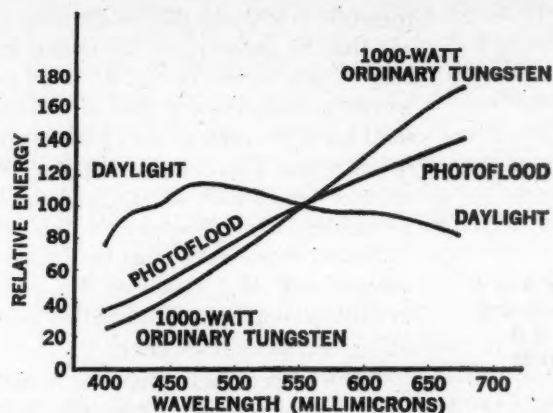
Here's how relative energy curves are obtained from measurements made of the light source: one wave length is taken as a reference, usually 550 $m\mu$ because this is at the middle of the visible spectrum; the intensity of the light produced at other wave lengths is compared with that produced at 550 $m\mu$, which is arbitrarily called 100 percent. Such curves, for several different sources of light, are shown on the *next two pages*.

Note that the graphs all intersect at 100 percent at the center of the visible spectrum. This does not mean that all these sources produce the same amount of this color of light; it is only a consequence of the way the graphs are plotted. Here is the kind of information you can get from such curves.

The graph on the *next* page shows: 1. Both tungsten lamps produce relatively more red light and less blue light than you get from daylight. This demonstrates the need for corrective filters when you use in daylight a color

**How relative light
energy curves are
plotted and measured**

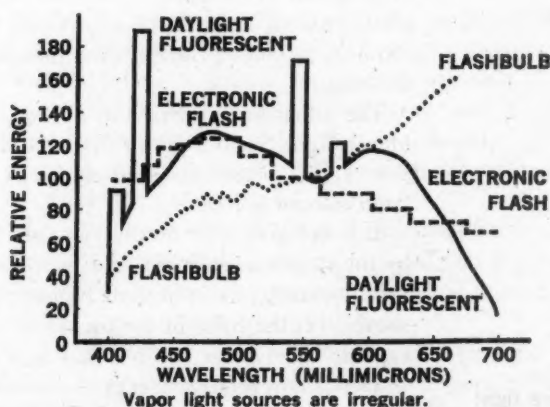
The higher the temperature, the bluer are tungsten floodlamps



Tungsten lamps produce more red light than does daylight.

film made for exposure to light from tungsten lamps. 2. The tungsten lamps differ among themselves, with the lamp of higher temperature giving relatively less red and relatively more blue light. 3. The curves for the tungsten lamps are smooth and regular, but the daylight curve is somewhat irregular in appearance. This is the basis for the statement, previously made, that the concept of color temperature is usefully applied to tungsten lamps, but not too helpful when applied to daylight.

The graph below gives a similar curve for three other artificial light sources. All are quite irregular. This is due to the spectral lines of the vapor present in the fluorescent lamp and the electronic flash lamp, and probably to some extent in the ordinary flash lamp. Color temperature designations are of no real value for the first two, and probably of limited usefulness for the last one.

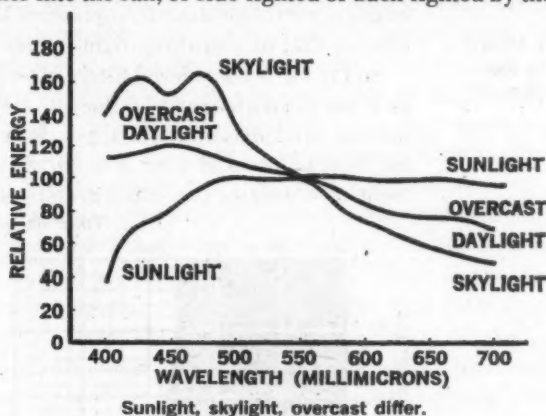


The graph, *top next page*, shows curves for different outdoor lights. These are representative only, because light from the sun, the sky, and the mixture of the two varies fantastically with weather conditions, the time of day, the season of the year, and your position on the earth's surface. The curves do show that skylight is generally rich in blue light, that sunlight is much redder and less blue, and that light on an overcast day lies between blue skylight and redder sunlight. These curves, by their irregularity, indicate why color temperature is of very little usefulness in outdoor color photography.

Color photography outdoors is therefore beset by many difficulties. You are nearly always concerned with two different sources of light (skylight and sunlight), both of which are changing in quantity and color. The colors and

Sun, sky, weather, time, season, position on the earth all affect daylight

the relative amounts of these two sources are usually unknown. The amount of sunlight or skylight falling on your subject depends on the way the subject faces—whether into the sun, or side-lighted or back-lighted by the sun.



**COLOR: WHAT YOU
SEE IS ONE
THING, WHAT
EXISTS ANOTHER**

You must distinguish between the colors you see and the colored substances themselves. We shall restrict the term "color" to mean solely your response to light entering your eyes, and use the word "colorant" to mean the colored surface or object at which you may be looking. There is normally a close connection between the object and the sensation, but they are not the same thing at all. Colors are personal and private—subjective—feelings which are not really capable of examination except by the person experiencing them. Colorants are physical objects which can be studied with suitable apparatus.

You can see the effects of any colorant on light by examining how that colorant changes the spectral distribution of the light it receives from the source. We can thus learn just what filters actually do when filtering light. A comparison of the original spectrum and that of the same spectrum after it is changed by the filters would show you that the effect of the colorant is to remove light from whatever is produced by the source. No filter (or other colorant) can do anything else; it never adds any light to what it receives, but only absorbs some. For instance, a yellow filter absorbs the blue light that was present originally; a deep red filter absorbs the blue light and the green light effectively; a deep green filter absorbs most of the blue and red light; a blue filter strongly absorbs the red light and most of the green light.

Note that we have *not* described the filters in term of the light they pass; this is not an especially useful way of describing most filters, and for the yellow filter it may be entirely misleading. It is true that a yellow filter transmits yellow light, but it also transmits red and green light equally well.

What happens when you use a yellow filter to dramatize cloud effects in black-and-white photography? The yellow filter absorbs blue light. If the sky is quite blue, this absorption of blue light reduces the sky exposure on the negative, and therefore darkens the sky in the print. Provided you have used the proper filter factor, the clouds will be reproduced as they would have been without the filter. As a result, the clouds contrast better with the sky and are therefore emphasized. The effect of the filter is to change the rendition of the sky, not the clouds.

Here's a further example—how a conversion filter makes daylight approximately equivalent in effect to tungsten light. Average daylight contains much more blue and a little more green light than does tungsten light. You use a filter which absorbs the excess blue and green light—an orange filter.

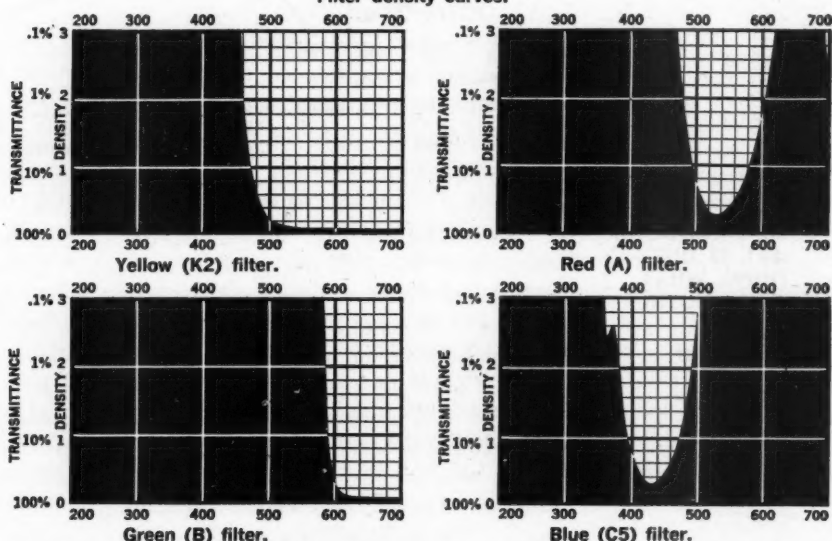
**Filters don't add
color—they absorb
it instead**

We can label filters according to the color they absorb

Now you can see the reason why filters are often designated in terms of the light they absorb. A yellow filter is called a "minus-blue" filter; a red one "minus-cyan," that is, "minus blue-green," and so on. This way of describing filters is useful because it emphasizes the essential characteristic possessed by filters—that of absorbing light differently in different parts of the spectrum.

So far we've considered filters in terms of what the light looks like after part of it has been absorbed by the filter. For many photographic purposes, more precise information about filters is necessary, obtained by measurement of the light before and after it is affected by the filter. Results of such measurements are usually presented graphically, plotting a number representing ab-

Filter density curves.



sorption against wave length, as *above*. Here you see curves for four filters—yellow, red, green and blue. The vertical scale shows values for both transmittance and "density" of the filters; it is the density which is related to the absorption of the colorants. Density is defined as the logarithm of the following ratio: the intensity of light received by the filter, divided by the intensity of the light it transmits.

Curves plotted in this way are not very easy to interpret. First, the white part of the graph does not really show what the filter transmits, nor does the black part show what it absorbs. The only significant part of the graph is the edge—the boundary between the black and white parts—and this should be thought of as like any line graph. Secondly, the use of a logarithmic definition for density makes the absorption of the filter (as it changes with wave length) seem to behave in a peculiar fashion. For example, the curve for the yellow filter shows that it has a density of 1.0 for light whose wave length is about 470 m μ ; its absorption for this kind of light is 90 percent. The same filter has a density of 2.0 at about 460 m μ ; here it absorbs 99 percent of this kind of light. At a density of 3.0 this filter has an absorption of 99.9 percent. Put another way, equal spaces on this kind of graph do not have equal significance as you follow the curve upward. A change in density from 0 to 1 changes the absorption from zero to 90 percent; from 1 to 2 changes the absorption by only 9 percent; and from 2 to 3 the change is a mere fraction of one percent.

The use of a logarithmic scale, awkward as it is in interpretation, is exceptionally useful in some respects. One advantage is that the effects of two or more filters can be found simply by adding the densities of the individual

Plotting the amount of light a filter absorbs and the amount transmitted

**By combining filters
we can absorb a
great number of colors**

filters. Other numerical methods of expressing the effects of filters cannot be worked with so easily.

Color correction filters are commonly designated in terms of the density at the highest part of their curves plotted as in those above. Such filters are used to produce small changes in the color of the light from a source in, for example, color printing where a slight change in the color balance of the print is needed. Such a system designates one such filter as CC-30R. Here CC means "color correcting"; 30 means that the filter has a peak density of about 0.30; and R means that it is a red filter (blue-green absorbing). This filter would absorb about half of the blue and green light falling on it.

Filter combinations, where two or more filters are placed in the same beam of light, are best understood by considering the combined absorptions of the filters. Suppose that we overlap a strong blue filter and a strong red filter, and consider what light would pass through: the blue filter absorbs nearly all the red and green light; the red filter absorbs nearly all the green and blue light. The net result is that practically no light of any kind can pass through the pair, since each of the three spectral regions is strongly absorbed by at least one of the filters. If you overlap a CC-30M (for magenta, minus-green) filter and a CC-30Y (for yellow, minus-blue) filter, you have a pair which together absorb some green light and some blue light, so you would have a red filter in effect. This pair of filters is equivalent to a CC-30R filter.

So far, in discussing colorants, we've spoken only of filters. The concepts we have presented are, however, equally sound for understanding other colorants—paints, dyes and colored objects generally. These colorants act just like filters. They modify the light they receive by absorbing certain spectral colors more than others. A yellow flower is yellow because it absorbs only blue light significantly; green foliage absorbs only blue and red light effectively; a red apple primarily absorbs blue and green light. A black object absorbs strongly in all three spectral regions; a white one has little absorption for any region. Most reflecting surfaces do not absorb light as definitely or as strongly as deep filters do; curves showing the absorption of light by such surfaces are not so steep in the region where a filter would show a sharp distinction between the light it absorbs and the light it fails to absorb. Nevertheless, you will make no serious error if you think of colored objects (other than filters) as being like filters in their effects on light.

**You may think blue
paint is blue but
it isn't blue at all**

A confusion arises, particularly in connection with paints and paint mixing, from a faulty set of color names. Most paints called "blue" are not really blue, but cyan; that is, they are not red-green absorbing but primarily red-absorbing colorants. Most yellow paints, however, are truly yellow; they absorb blue light effectively. When you mix "blue" paint and yellow paint, you are doing the same kind of thing as when you overlap filters, because the little bits of pigment mostly lie on top of each other. If you mix a "blue" paint and a yellow paint and get a green appearance as a result, this can only be because the yellow paint absorbs blue light, the "blue" (really cyan) pigment absorbs red light, and the green light which is not absorbed by either is what you see. If the "blue" paint were really blue, it would absorb green light as well as red light, and the mixture of yellow and blue pigment would absorb practically all kinds of light equally, giving a very dark gray or black appearance. Similarly, most paints called "red" are not really red, but are often magenta; not blue-green-absorbing but only green-absorbing.

In effect here's what happens when a colored object is photographed using a filter on the camera: The colored object acts as a filter, absorbing some color of light; the remainder falls on the filter placed on the camera, where some

TWO BASIC COLOR PROCESSES: LIGHT AND COLORANTS

Additive color: We add together different amounts of colored light

more light may be absorbed. What light is left is available for exposure in the camera. Thus the light acts as if it were affected by two filters in succession.

Suppose that a deep red filter is used to photograph a really blue object. The light from the source is received by the object, which, since it is blue, absorbs much of the green and red light which is produced by the light source. The remainder of the light, mostly blue, is reflected to the filter. But the filter, being red, absorbs blue light very effectively. The net result is that very little light from this blue object penetrates through the filter to expose the film in the camera, and the blue object will be reproduced as a small density in the negative. If the same filter is used to photograph a yellow object, the object will absorb only blue light, the filter will absorb green light (the blue is already gone, having been absorbed by the yellow object) and red light is then available to expose the film.

All the colors you see around you—house paints, dyed fabrics, the color pictures in magazines, color transparencies and prints, color television—are produced by means of only one of two different methods of color formation. Either method yields an amazing variety of colors through the use of only *three* basic colors—either colored lights or colorants (dyes).

We're primarily concerned with the two methods of color formation and the essential steps in any photographic color process. A clear understanding of these fundamentals can help you to appreciate what color photography can do, and to use color materials with insight and assurance.

We can produce a great variety of colors by the following method: we begin with a dark projection screen, on which no light is falling. We then turn on a projector which causes *blue* light to reach the screen. We provide a method of making this blue light more or less intense; we thus can produce a number of different blue colors—bright blues and dark blues. If we use also a second similar projector, which causes *green* light to reach the screen and partly overlap the light from the first projector, we now can produce many more colors—a series of greens where only the light from the second projector reaches the screen, and a series of blue-greens (cyans) where the two projected beams overlap. This latter series could be made not only differing in lightness or darkness, but also in greenishness and bluishness. The addition of a third projector, utilizing *red* light, completes the system.

Fig. 5 is a photograph of just such a triple projection system, representing in a single picture only a few of the possible colors that can be produced by changing the intensities of the three projected beams of light. Each of the three beams of light is falling singly on the screen, and also overlaps each other beam. A cyan color appears where the blue and green beams overlap. The overlapping of the red and blue beams yields a magenta color (red-purple). The mixture of red and green light, however, produces a most amazing result: *yellow*, which in no way resembles the red light and the green light. And now, in the triple overlap, you find the color we call white. Where no light from any projector falls on the screen a black area appears.

This illustrates the method of color formation which is called *additive*; the word "additive" implies that different colors are produced by adding together different amounts of different colors of light. Every example of such a method of color reproduction requires the use of the three colors represented in this illustration: red, green, and blue. Here is a tabulation of the basic facts of additive color formation using the three basic colors:

RED + GREEN LIGHT forms YELLOW	GREEN + BLUE LIGHT forms CYAN
RED + BLUE LIGHT forms MAGENTA	RED + GREEN + BLUE LIGHT forms WHITE

All three colors can form white; no light produces black

This table lists only the elementary combinations of these lights; only a certain intensity of red light mixed with a certain intensity of green light produces yellow. If the relative intensities of red and green are changed, a whole series of colors can be produced: red, orange, yellow, yellow-green, green. The same is true of the red and blue light combination and the blue and green light combination. Similarly, with a certain intensity of red light, we can produce "white" only by using the proper intensities of green light and blue light. The brightest white is limited only by the greatest intensities of light the projectors can put on the screen. The color "black" would be produced by reducing the intensities of the projectors so that no light (or almost none) fell upon the screen. Grays would be produced by using only weak intensities of light from each of the three projectors. Many browns are dark yellow in color; these we could produce by only a little light from the red and green projectors. By effectively controlling the operation of the three projectors, practically any color at all can be produced.

There are two other techniques of applying the principles of additive color formation. A single projector can be used which projects three colored images in rapid succession with red, green, and blue following each other so rapidly that your eyes can't distinguish the individual projected colors. This method is now obsolete, though it was used at one time for producing color movies. In a second process, small transparent bits of red, green, and blue are placed side by side to form the picture. The bits are so small that your eyes cannot readily distinguish them as colored spots. This is the method used in color television; the picture is made up of small discs of red, green, and blue light. Seen from the proper viewing distance, these discs blend to form the colored image, and with their intensities electronically controlled, they reproduce the colors of the original subject.

Subtractive color: Instead of adding colored light, use colorants

The second method of color formation, though it may produce nearly the same results as the first, involves quite a different principle. Now we deal with the combining of colored substances, *not* colored lights. Such colored substances are variously called dyes, inks, or pigments; we shall call these *colorants*. We've already seen the essential property of such colored substances is that they absorb only certain colors of light strongly, as follows:

COLORANT	COLOR OF LIGHT ABSORBED
Cyan	Red
Magenta	Green
Yellow	Blue

Examine carefully Fig. 6, a photograph of some color filters placed over an illuminator. In the right-hand part of this illustration, you see several colors including the same ones you saw in Fig. 5. We have here produced, from three filters, the colors red, green, blue, cyan, magenta, yellow, black, and white. Whereas in the additive method of color formation we began with a dark (black) screen and added light to it, here we had to begin with a white illuminated surface. The white light used here had to contain some light in all the areas of the spectrum; the essential requirement is that the white light must contain red, green, and blue light.

In this picture you see that a green color is formed from the overlapping of the cyan and yellow colorants (filters). Why do you see green in this case? The white light from the viewer supplies red light, green light, and blue light. The cyan colorant absorbs the red portion of the white light, and prevents it from reaching your eyes; the yellow colorant absorbs the blue part of the white light and prevents it from reaching your eyes. The only part of the white light not absorbed by either colorant is green, which you therefore see.

The following table is intended to summarize the information in Fig. 6:

COLORANTS	ABSORB	PRODUCE
Magenta and Yellow	Green and Blue	Red
Cyan and Yellow	Red and Blue	Green
Cyan and Magenta	Red and Green	Blue
Cyan and Magenta and Yellow	Red and Green and Blue	Black
None	None	White
Red and Green	Blue and Green and Red	Black
Blue and Green	Red and Green and Blue	Black
Magenta and Green	Green and Red and Blue	Black

Red, green, and blue *colorants* cannot be used to produce other hues. The only colorant mixtures that produce a color other than black are the combinations of cyan, magenta, and yellow.

By using cyan, magenta, and yellow colorants in combination, and by varying the strengths of these colorants, we can obtain almost any other color we desire. Black is produced by the overlapping of strong cyan, magenta, and yellow colorants. Lesser amounts of these three colorants would yield grays. Pink would be obtained by using a weak magenta colorant; an orange hue would be obtained by using a large amount of the yellow colorant and a lesser amount of magenta; a chartreuse would be obtained by using a large amount of yellow and a lesser amount of cyan. The brightest white obtainable would depend upon the intensity of the unobstructed light source.

This second method of color formation is called *subtractive*, because it depends upon the use of substances which remove varying amounts and colors of light from an initially white source of light.

Now you've seen how colored lights and colorants may be combined to give different visual sensations. Let's apply this to color photography. A preliminary process is necessary to make a color picture. This is the process of recording the subject by a photographic method. All three-color processes must begin in the same way, regardless of how the picture is finally produced.

Think of the photographic film as being like the retina of the eye. This artificial retina, looking at a colored subject, receives energy in the form of red light, green light, and blue light. Color film must somehow find out how much of the energy it receives is red light, how much is green light, and how much is blue and record these components properly.

Fig. 10 shows a simple subject, and one method of separating the light from the subject into these three components. We can use a panchromatic black-and-white film which is sensitive to red, green, and blue light.

The subject was first photographed through a red filter, then through a green filter, and finally through a blue filter, on three separate pieces of film. After processing, they reveal three separate records of the subject—three *separation negatives*. Examine them carefully:

1. The red separation negative is dense, or heavy, in those areas where red light was reflected from the subject.
2. The green separation negative is dense in those areas where green light was reflected from the subject.
3. The blue separation negative is dense in those areas where blue light was reflected from the subject.

Notice that the yellow patch of the subject is recorded as a dense area in both the red and the green separation negatives. To understand this, you should recall that a yellow object absorbs only blue light effectively; it therefore reflects both red and green light well. Therefore, both the red and green negatives record light from the yellow patch and produce a heavy density.

White is formed
where there are
no filters at all

In photography we
divide the subject
light into red, green
and blue light

Kodachrome, Anscochrome, Ektachrome, Kodacolor perform in a similar way

Every three-color process (Kodachrome, Anscochrome, Kodacolor, etc.) performs in a similar way even though the images are recorded on a single piece of film. Manufacturers of subtractive color films make this possible by coating three differently sensitized photographic emulsions on a single film base. One of the sensitive layers responds only to red light, one to green light, and one to blue light.

You must be quite clear in your understanding of what is contained in the separation negatives. The red-record negative must contain a record of only one kind of information: the densities in this negative must be present only where there was red light coming from the subject, and must not record the blue or the green light. Similarly, the green- and blue-record negatives must record only the green and the blue light reflected from the subject.

Now that the subject has been analyzed into its red, green and blue components, it must be put back together again by some process which recreates the original colors. This process may be done by either the additive or the subtractive methods previously described.

In all processes we are interested in seeing the picture as it originally was—as a positive image. The first step then is to make three silver positive images, one from each of the three silver separation negatives. What do the separation positives record? If you recall that the silver densities in the red-record negative are formed where red light is reflected from the subject, then the densities in the positive (made from this negative) are recorded in reverse. The red-record positive has density in those areas where *no* red light was reflected from the subject. Similarly the green and blue positives will have density in those areas which *failed to* reflect green and blue light respectively.

To see how we can reconstruct the colors of the subject by using these three positives, refer to Fig. 10 where the subject, the negatives, and the positives are shown separately so they'll be easier to explain. In this additive process, we can use three projectors. We place the red separation positive in the red-light projector. Now you should see that since this positive contains density in those areas which reflected no red light, it will in those same areas prevent red light from reaching the screen. This positive is thin in those areas which did reflect much red light from the subject, and will, for those areas, permit red light to get to the screen. Therefore, the red light is falling on the screen in the same amounts and in the same places where red light was reflected from the subject.

Similarly, we place the green-record positive in the green-light projector, and the blue-record positive in the blue-light projector. We project the three images on the screen exactly over each other. If this process is carefully done, we see on the screen a reproduction of the original subject. The step-by-step parts of the entire scheme are outlined in simple terms as in the following table:

How does the process get the color image together again?

	ANALYSIS IN TERMS OF DENSITY			SYNTHESIS IN TERMS OF DENSITY		
	Red Negative	Green Negative	Blue Negative	Red Positive	Green Positive	Blue Positive
Red flower	Large	No	No	No	Large	Large
Green leaves	No	Large	No	Large	No	Large
Yellow pot	Large	Large	No	No	No	Large
Black base	No	No	No	Large	Large	Large
White background	Large	Large	Large	No	No	No

Project with three projectors and you have an additive color picture

Use cyan, yellow, magenta images atop one another; it's a subtractive picture

Notice that for the yellow pot, the absence of density in the red and green positives permits red and green light to reach the screen; a mixture of red and green light has been shown to produce a yellow color. For the black base, no light reached the screen from any projector. For the white background, all the projectors produce light on the screen, giving the color white.

In this additive color process, we use silver positives to absorb the right amounts of the red, green and blue light in the projection system. If we substitute a colorant (a dye) for the silver image, then we do not essentially change the effects of the positives. What dyes would we use? In the red projector we need a dye that absorbs only the red part of the spectrum; a properly made cyan dye image is nearly as effective in absorbing red light (and almost only red light) as is a silver positive image. In the green projector we need a dye that absorbs only green light; such a dye is a magenta dye. In the blue projector, a yellow dye may be used to absorb blue light just as effectively as does a silver positive image. If we substitute positive images of these three dyes, and use three projectors as before, we still have an additive color picture. However, if we make a different arrangement of the positive dye images, we will now have the basis of the *subtractive* method of forming the color image.

We make this rearrangement by placing the three dye images one on top of another, and using a *single* projector. We can do this because the dye images, unlike silver, absorb only one color of light, and are transparent to the other two basic colors. We therefore combine the three dye images together in exact registration, to make a tripack, and use one white-light projector. When we now project the cyan, magenta, and yellow images onto the white screen, we will see essentially the same picture as when the three separate projectors are used. The red portion of the white light is now being controlled by the density of the cyan image alone; the green portion of the white light is now being controlled by the magenta dye image; the blue part of the white light is now being controlled by the yellow dye image. The cyan, magenta, and yellow dye images act as light valves, letting only so much red, green and blue light pass. Where we use cyan, magenta, and yellow colorant images physically in register with each other, and viewed by (or projected with) white light, we have a subtractive three-color process.

In Fig. 11 you see the three dye positives of the subject we have been using as an example. Here is the step-by-step analysis of how this method works:

	CYAN POSITIVE	MAGENTA POSITIVE	YELLOW POSITIVE
Red Flower	No	Large	Large
Blue Flower	Large	Large	No
Green Leaves	Large	No	Large
Yellow Pot	No	No	Large
Black Base	Large	Large	Large

Consider now the sequence of operations affecting some of the areas of the original subject:

1. The green leaves were reproduced only in the green-record negative as a large density; the other two negatives were thin in the area representing this part of the subject. When the positives were made, no dye was formed in the magenta positive; a large amount of dye was formed in both the cyan and yellow positive images. In the finished reproduction (also shown in Fig. 11), the cyan and yellow dyes are superimposed; together they make a green

patch. Why? Recall that a cyan dye absorbs red light, and that a yellow dye absorbs blue light. The pair fail to absorb green light, and this is what you see when the two dyes are superimposed.

2. The yellow pot is recorded as a large density in both the red- and green-record negatives, but as a thin area in the blue-record negative. Since the positives are reversed in color, only the yellow-dyed positive will contain any dye, hence only yellow dye is formed for this area.

3. The black part of the subject was recorded as a thin area in all the three negatives, and as a dense area in all the positives. This patch was therefore recorded as a large deposit of all three dyes, which superimposed absorb red, green and blue light, leaving very little light to be reflected.

4. The white background was recorded as a large density in all the negatives, and as a thin area in all the positives. Since no dye was formed in any of the positives, practically no light is absorbed, and you see a white patch.

These four examples illustrate the subtractive process. Although we have used simple colors in the illustration, this discussion should suggest that such a process can reproduce (more or less exactly) almost any color in the subject.

TIPS AND HINTS ON SHOOTING TRANSPARENCY FILMS

Why use reversal film (we'll take up negative processes next month) in preference to a film which yields a color negative from which a color print could be made? To begin with, a reversal transparency is generally more brilliant, more saturated, and more accurate in color reproduction than a color print made from a color negative. Also, you may prefer to show your pictures by projection to a group of people. But it's hard to make good duplicate transparencies from reversal films. You will therefore use reversal film when you want only one record of a scene.

Color film manufacturers are not able to make a universal color reversal film; that is, one that can be used indiscriminately with any light source. They have had to choose lighting conditions that you would be most likely to use, and make their color films to produce good results under those conditions. (As we'll see later, certain filters can help you achieve better results under lighting conditions which differ from those chosen by the film manufacturers.)

Color films are made for four quite different sources: daylight, clear flash-lamps, and two different tungsten lamps—3200°K and photofloods. Each source has characteristics that you should be familiar with.

1. *Daylight*: The daylight prescribed for color films is a very definite kind of light: sunlight mixed with skylight. Sunlight alone is yellowish in color; skylight alone is bluish in color. Together they give the proper balance for daylight color films, but only if the season, the time of day, and sky conditions are right. If you take a picture early in the morning or late in the afternoon, the results will be very warm in tone, or slightly orange.

An overcast day may not give the kind of light required for daylight color films; your pictures may be too bluish. In addition to off-color results, pictures taken on overcast days without proper filters will not have the color quality that sunshine gives, because of the diffuse, indirect lighting.

Ideal conditions for outdoor color photography, according to the film manufacturers, are in summertime, on a bright day, within two or three hours of noon. However, we know that for practical picture-taking a high sun is difficult to handle since it produces all sorts of ugly eye, nose and chin shadows.

2. *Flashbulbs*: There are many different kinds and sizes of flashbulbs, but for the present purpose only wire-filled ones are suitable. The *clear* bulbs are to be used with color films marked "flash" or "type F." *Blue-coated* bulbs may be used, but only with daylight films; the blue filter on the bulbs produces a

What's the best time
to shoot pictures
in daylight?

**Why fluorescents
aren't good for
color photography**

**At what shutter speed
is color film accurately
balanced?**

light roughly akin to daylight. The blue bulbs, however, are best used as fill-in flash outdoors, where the main illumination is daylight.

3. *3200°K tungsten bulbs*: This source is primarily used by professional photographers for studio work. The designation "color temperature" is a numerical indication of the visual color of a source. It is usually expressed in degrees Kelvin after the man who established the system. The larger the number, the bluer the light source; the smaller the number, the yellower the source.

Normal daylight is said to have a color temperature of about 6500°K, whereas ordinary light bulbs have a color temperature of about 2850°K.

3200°K tungsten lamps are preferred by the professional because they are very carefully made, long-lasting, and fairly stable for a considerable time. There are color films specifically intended for use with these lamps.

4. *Tungsten photofloods*: These produce a high level of illumination, but they are very short-lived, lasting only a few hours. Their color temperature is about 3400°K, and should be used with color films especially designed to give good color balance with this kind of lamp.

There are two sources which deserve special attention. The first of these is electronic flash. Electronic flash is an excellent source for use with *daylight* color films. Some units, however, when used with certain color films designed for a specific light source require the use of a color compensating filter on the camera to produce the best color balance. Only a test exposure will tell you if this is necessary with your unit.

The second source is the fluorescent lamp. Those in use today are not very satisfactory for high-quality color pictures because they do not produce enough red light. Many colors are not reproduced correctly with fluorescent lights, and therefore you should avoid using them.

We shall mention later the use of filters to permit you to use with a particular light source a film intended for use with another light source. In general you do best by selecting that film which is specifically intended for the source you are using.

The exposure latitude of color transparency materials is limited. You must be quite accurate about exposure determination. Normally $\frac{1}{2}$ stop over and $\frac{1}{2}$ under the ideal exposure level are the limits within which you must work (see Figs. 7, 8 and 9).

The film manufacturer tests his color film at a certain exposure time, often $\frac{1}{50}$ second. At this exposure time, the color balance will be the best possible. Satisfactory pictures may be made using a range of exposure times near the test exposure time. Within a range of 1 to $\frac{1}{200}$ sec., you should obtain a satisfactory picture. If, however, you take a picture with long exposure time (say 10 sec.) or a very short exposure time (say $\frac{1}{1000}$ sec.) you may expect a change in color balance. Different emulsions and different kinds of color films will vary in the amount of change for long and short exposure times. Only by making a test on each emulsion can you tell how it will perform. (Manufacturers of cut sheet color film indicate for each emulsion how it changes with a change in exposure time.)

There are many situations in which you will find it necessary to use filters for color films. Here are some suggested uses:

1. Color films designed for use with a certain illumination may be used with a different one, provided the proper correcting filter is placed over the camera lens. For example, flash-type films may be used in daylight if you use a Wratten 85C (light orange) filter over the lens. Check the manufacturer's recommendation to see exactly which filter is required for a given illuminant, and for the increased exposure time or aperture you must use. (See MODERN PHO-

How to get rid of
color casts
by using the
right filters

Ansochrome or
Ektachrome—which
is the easier to
process at home?

TOGRAPHY, August 1960, where there is a complete listing of such filters.)

2. When you take pictures of mountains or seascapes, your color film will often record an atmospheric haze which gives the transparency a bluish-purple overcast in distant areas or overall. This effect is caused by the ultraviolet radiation which you cannot see but to which the film is sensitive. Ultraviolet absorbing filters—Ansco UV 16, Kodak Skylight—will improve such shots.

3. If you find that the particular emulsion you are using produces transparencies with a slight color cast, you can correct this by using a "CC" (color-compensating) filter whose color is the *complement* of the color cast you desire to reduce. To correct a reddish cast, you would use a cyan filter (which reduces the amount of red light reaching the film). We are assuming, of course, that your film storage and processing techniques are correct.

Manufacturers of cut sheet color film often include recommendations with each box which state the color-compensating filter (or filters) necessary to produce a satisfactory transparency. You may, however, need to use filters slightly different from those recommended.

The latent images (invisible images formed in the emulsion by exposure) begin to change immediately after the exposure is made. This rate of change is ordinarily slow. If the exposed color film is kept under unfavorable storage conditions, however, the change will accelerate, ruining all your efforts in a short time. Color film should be processed as soon as possible after it is exposed. If you must wait for processing, then the film should be stored in a cool, dry atmosphere. In warm weather, whether the film is protected by drying agents or not, the exposed film should be temporarily stored in a refrigerator.

There are many color finishers and processors all over the United States, and all over the world, for that matter. However, color film processing can be done at home, if manufacturer's instructions are carefully followed.

The following tables give you an idea of the steps and times involved for processing two popular reversal color films.

ANSOCHROME ROLL FILM (Processing Temp. 68F)

1. First Development16½ min.
2. Short Stop 2 min.
3. Hardener 4 min.
4. Running Water Wash 5 min.
5. Reversal Exposure *
6. Color Development14 min.
7. Short Stop 2 min.
8. Hardener 4 min.
9. Running Water Wash 5 min.
10. Bleach 5 min.
11. Running Water Wash 5 min.
12. Fixing Bath 4 min.
13. Running Water Wash 5 min.
14. Stabilizing Rinse 5 min.
15. Running Water Wash 5 min.
16. Final Rinse30 sec.
17. Drying *

EKTACHROME ROLL FILM (E-2) (Processing Temp. 75F)

1. First Development10 min.
2. Running Water Rinse 1 min.
3. Hardener 3 min.
4. Running Water Wash 3 min.
5. Reversal Exposure *
6. Color Development15 min.
7. Running Water Wash 5 min.
8. Clearing Bath 5 min.
9. Running Water Wash 1 min.
10. Bleach 8 min.
11. Running Water Wash 1 min.
12. Fixing Bath 3 min.
13. Running Water Wash 8 min.
14. Stabilizing Bath 1 min.
15. Drying *

* See specific recommendations by the manufacturer.

Note: Steps 1 through 3 must be carried out in total darkness. The remainder may be done in room light.

The dyes in processed color materials are made as stable as possible. If, however, you keep the finished transparencies in poor storage conditions, you

Are you viewing your transparencies with the proper light?

are bound to find changes occurring. Some storage conditions you should avoid are: 1. Damp rooms, like basements; 2. Hot rooms, like attics; 3. Rooms where there are likely to be acidic gases, such as hydrogen sulfide. Store your transparencies where it is dry and cool.

There are other things you can do to prolong the life of a transparency. Handle it only by the edges. Protect it by enclosing it in an acetate sleeve or by binding it in glass. Keep transparencies away from sources rich in ultraviolet radiation like the sun: ultraviolet causes rapid fading of the dyes. Your transparencies are best stored in the dark.

Fingerprints are difficult, if not impossible, to remove. Kodak Film Cleaner will remove some fingerprints. *This cleaning agent should be used sparingly, and in a well-ventilated room; do not breathe its vapors.*

Some color finishers apply a protective lacquer to color films. If this coating becomes scratched, it should be removed and reapplied, following the manufacturer's instructions.

A single transparency will look somewhat different if viewed with different light sources. It would seem appropriate to adopt a standard for viewing all color transparencies. The illumination should appear white to the eye; it must produce adequate amounts of red, green, and blue light. Since the two most common sources are daylight and tungsten light, it seems sensible to choose a color of light about midway between these two. A source with a color temperature of about 4000°K, using a filtered tungsten lamp, meets these requirements.

The required brightness of the illuminator varies, depending upon the light in the room where it is to be used. A Weston reading of 100 at the illuminator is satisfactory if there is not much room light. A 60-watt blue tungsten bulb placed behind a ground glass produces this approximately. A larger bulb should be used if there is much other room illumination.

The projection of color slides is not as critical because of the adaptation characteristics of your eyes. If, however, you have stray light in the room of a color different from that from the projector, the slides will appear inferior. A good projector should produce a high level of light on the screen, and with good uniformity across the screen.

The color film manufacturer has to make his product for the average person, at a reasonable price. He must therefore allow some variations in the product in color balance and speed.

Other variations in quality will be introduced by your own handling and by the processor. These small variations can cancel each other out or—unfortunately—combine to produce an undesirable picture.

The variations in your own equipment must be taken into consideration. Few if any shutters, whether leaf type or focal-plane, deliver exactly the speeds engraved on the shutter-speed dials. While the speed errors are well within the tolerances allowed by the manufacturers of the equipment, the errors, if in the same direction as the other variations mentioned, can seriously affect your determination of the proper exposure.

The characteristics of your camera's lens and the anti-reflection coating, whether blue or amber, can have an effect on the color balance of your transparencies. Moreover, should you use more than one camera and lens, the errors in speed and in color balance may vary as you vary equipment. All these factors at one time or another have been blamed on the manufacturer of the film. Given all these variables, it's amazing that we're rewarded with satisfying results at all.

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TO HOT TO HANDLE

(Continued from page 57)

Voigtlander Bessamatic. Which would best suit my needs?—Sidney D. Nolan, Jr., Orlando, Florida

Only one—the Heiland Pentax will come near. Reason? The leaf shutter used in the other three excellent cameras limits lens interchangeability to lenses from 28 to 135mm made for that specific camera. As far as perfect resolution is concerned, there is no such animal. However, we found resolution on the 55mm Takumar f/2 to be good at f/2.8.

Is the Praktica FX 2 with 50mm f/2.9 Trioplan lens a good buy at \$49.99?—Norman L. Clark, Moscow, Idaho.

While the Praktica FX is a good buy at the low prices now being quoted for it, we would not recommend the Trioplan lens. The Trioplan is a three-element optic whose definition at large apertures is, to put it charitably, feeble. Instead, see if you can get the camera with the 50mm f/2.8 Tessar lens.

OUTER SPACE

(Continued from page 63)

a tripod. Particularly useful for photographing the stars is 3000-speed Polaroid film in a Polaroid Land 110 or 110A. Don't think that color photography is beyond you. If you have a 35mm camera with an f/2 lens or thereabouts you can record all the stars you can see using a 10-second exposure and High Speed Ektachrome (E.I. 160).

The secret of obtaining good star photographs is to use the longest exposure possible that will show the stars as points of light instead of trails. (The apparent motion of the stars is greatest at the celestial equator and ecliptic area of the sky, or approximately the path of the moon, sun and planets. This motion decreases to nothing at our celestial pole, near Polaris.) In making my own exposures, I arbitrarily chose a maximum tolerable image movement of 1/300 in. I calculated that for the 5-in. lens I was using, the maximum allowable exposure time for stars near the celestial equator would be about 10 seconds. An approximate general formula using this tolerance is:

$$\text{exposure time (sec.)} = \frac{50}{\text{focal length of lens (in.)}}$$

By experimenting, I found that progressively longer exposure gave elongated star images and eventually star trails.

In the celestial polar area, the exposure time—with the same focal-length lens—can be increased up to about 30 sec. without undue apparent star motion. For shorter focal-length lenses the above exposure times can be

(Continued on page 118)

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OUTER SPACE

(Continued from page 116)

proportionately increased, while for longer focal lengths it must be proportionately decreased.

The Polaroid 110A has the advantage of giving a speedy check on your trial exposures (other Polaroid Land cameras, except the 110, are less suitable for astrophotography, owing mainly to their smaller effective aperture). Polaroid users should remember on cold nights to bring the film back to room temperature before development and should know that doubling the standard one-minute developing time (at room temperature) can improve most astronomical pictures, since maximum contrast is usually desired.

If you own a fast lens of from f/1.5 to f/2.8, the use of E.I. 1000 or faster films permits you to readily photograph Northern Lights (Aurora) and the brighter comets when they appear. Good work has been done with films one-tenth this speed; however, the newer films permit much shorter exposure, a few minutes at most, allowing you to obtain better pictures with less image motion and less obvious star trails. The lower photo, page 60, is an excellent example of comet photography.

Interesting eclipse photography can be done with an ordinary camera, such as a 35mm single-lens reflex with a 135mm telephoto lens—though longer focal-length lenses are desirable. The 35mm camera is especially useful if you want to take sequence photos showing the progressive stages of the eclipse. In shooting the sun, remember this: *never look at the sun through any optical instrument* (or even with the naked eye), unless means have been taken to greatly reduce the light. If you leave a filter off your lens, a hole burned in your cloth focal-plane shutter can be repaired; your eye cannot. Watch out for children, who will look through anything. More later about controlling the sun's light.

Now try a telescope

So far we've dealt with some of the many types of astronomical photography that you can do with just an ordinary camera and tripod. If you own, or can borrow, any kind of telescope, you can explore space in vastly greater detail. To take really worthwhile pictures of our nearby natural satellite, the moon, or of the sun, a telephoto or telescopic lens of 20-in. or longer equivalent focal length is essential for ease of operation. The angular diameter of these objects is about 1/2 degree, which means that the image produced by your 50mm lens is less than a quarter of the diameter of a pinhead—not much to work with! To find the approximate image diameter

of the sun or moon divide the focal length of your lens by one hundred.

If you do not own a telescope or a long-focus telephoto lens, don't think that you must rush off to buy a large, expensive telescope. A small all-purpose telescope, often referred to as a rifle range or target spotting scope, may very well suit your needs. (See the box on page 62). These smaller instruments are useful for nature and vacation photography as well as for taking excellent photographs of the moon, the sun, and distant terrestrial or high flying objects (see top photo, page 61). While there are many good makes available, I have used only the Bausch & Lomb Bal-scope and the Bushnell Space Master—both are excellent.

For your first eyepiece, choose a 20X; you can add higher power eyepieces later whenever you feel like spending some more money—with 35mm cameras, the 40X is possibly the most useful. (Incidentally, your wife may be much easier to sell on such an instrument, which can be enjoyed by all the family, than on another telephoto lens for your camera or a so-called astronomical telescope.) Special attachments are available for fastening cameras to these all-purpose telescopes, as described in the box on page 62. These make astrophotography really easy, particularly if you have a 35mm single-lens reflex.

Simple equipment, good results

Recently, while on vacation, I wanted to photograph the moon, and I had taken along only a Bushnell 45°-angle spotting scope and a Polaroid 110A camera (with the 3000-speed film, of course) plus two camera tripods. I arranged them—somewhat awkwardly—with the lens of the camera placed directly against the 30X eyepiece. A 1/15-sec. exposure gave a picture (middle page 61) which was sharp and clear. The image size produced by a 30X eyepiece with a 5-in. Polaroid camera lens is the same as that produced by a 150-in.—yes, a 12-ft!—telephoto lens. The ratio of the lens diameter (about 2 1/2 in.) to this equivalent focal length produces a speed of about f/60. The reason the diaphragm on the camera is left wide open is in order not to cut off axis rays from the eyepiece. The telescope system itself actually limits the aperture to f/60. Naturally I did a little experimenting to find the proper exposure needed. To find the equivalent focal length of your system, multiply the eyepiece power by the focal length of your camera lens. To find the f-number, divide this equivalent focal length by the telescope lens diameter. With apertures smaller than f/60, definition will begin to suffer.

Focusing using a single-lens reflex
(Continued on page 120)

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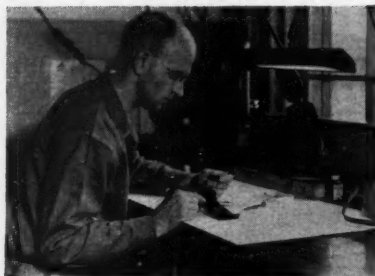
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Showmaster 500A	104.95	85.00	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	Prominent f2	•	129.50
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Balomatic 300	84.50	54.95	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	3 Lens Turret	133.45	84.40
Balomatic 305	99.50	65.80	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	BM f1.9	34.95	28.00
Balomatic 500	149.50	95.00	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	V-16	34.95	28.00
Balomatic 755	179.00	•	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	WESTON		
12 Slide Trays w/Case	24.95	18.75	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	Master III w/Case	32.50	21.50
BEAU			Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	Master IV w/Case	35.95	23.50
Lightomatic f1.9	112.45	78.95	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	ZEISS		
Supra Autotest f1.8	82.45	61.75	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	Contina I, f2.8 Tessar	•	10.95
Roca Prontomat f2.8	89.95	67.45	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	Contina-Matic II, f2.8	89.00	63.25
Auto-Terra f1.9	112.00	84.00	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	Contaflex I	•	48.50
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134TA Turret	•	•	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	Contaflex Prima, f2.8	166.50	•
Complete 3 Lenses f1.9	•	149.90	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	Contaflex Rapid, f2.8	186.50	99.50
127B w/f1.9 Lens	•	39.50	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	Contaflex Super, f2.8	216.50	127.90
390C	113.90	54.50	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	Contarax f2	476.00	•
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B&H Mag. 16mm f1.9	•	•	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	f1.5 Sonnar	306.00	208.50
Model 200-T	289.90	99.50	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	21mm f4.5 Bioton	209.00	157.00
200EE 16mm Electric Eye Mag.	359.90	124.50	Exakta VX IIA, PP/IR, Auto.	420.50	308.50	•	•	•	•	•	•	85mm f2 Sonnar	179.00	134.00
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OUTER SPACE

(Continued from page 118)

camera presents no serious problem—or with a camera where good auxiliary ground-glass focusing is available. These are recommended. Keep the camera lens centered on, aligned with, and at the proper (Ramsden disc) position close to the eyepiece. A little trial and error is in order here, so there's no need for a lengthy description.

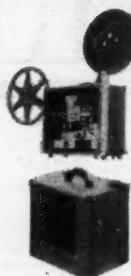
The Polaroid camera was chosen for quick results and to see what could be done with a roll film camera where no focusing is available. If one must use such a roll film camera for precise results, a low power auxiliary telescope should be used to adjust the primary photographic telescope at true infinity. For further details see the box on page 62, and also *Astrophotography with Your Camera* (a Kodak publication). Since my lunar photo was made the hardest possible way, with suitable attachments and a reflex camera you can easily do as well or better. Any telescope may be used photographically when suitably coupled to your camera.

Taming the sun

Solar photography is similar to lunar photography in one main respect: the sun does have approximately the same angular diameter as the moon, and thus produces about the same image size for a given focal-length lens or telescope setup. Nevertheless, the sun presents a new and big problem—it gives off thousands of times *too much* light for photography! (Once again, do not forget the warning about not looking at the sun through any unfiltered optical instrument.) You must reduce the sunlight falling on the lens by about 10,000 or 100,000 times before its intensity is suitable for average films at normal shutter speeds. There are actually many ways of doing this. For example, the image of the sun can be projected behind the telescope onto a white card. While this is good for visual observation, direct photography of such images is not too practical. (Sun spots, however, are often photographed by placing the back of a 35mm camera so that the image of the spot falls directly on the film plane.) A suitable filter or filters in front of the lens system itself is the easiest and most practical solution. The main problem here is that long-focus lenses are very sensitive to the optical quality of the filter, and precision optical filters can be quite expensive. However, Kodak gelatin neutral density filters are inexpensive in 2- or 3-in. squares—ample for most uses—although they require extreme care in handling. (Ask your Kodak dealer for pamphlet M-10, *Solar*

(Continued on page 122)

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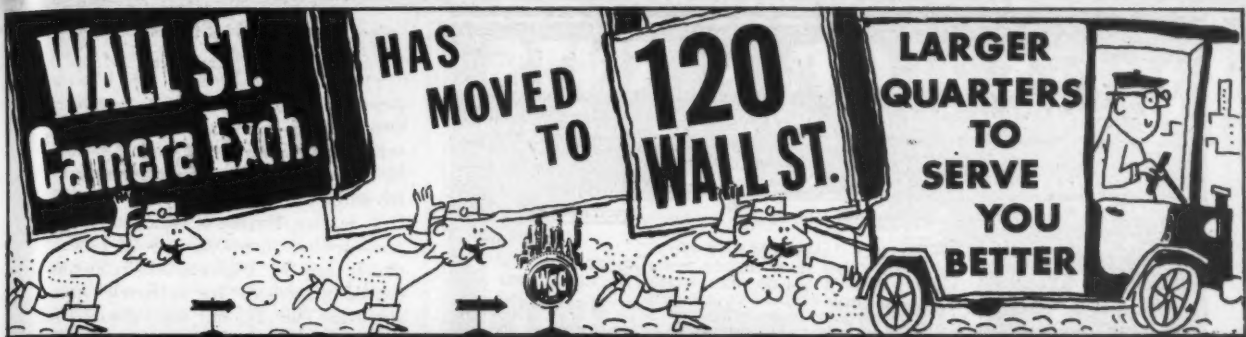
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OUTER SPACE

(Continued from page 120)

Eclipse Photography for the Amateur. One each of densities 1.0 and 4.0 will suffice for all our work, and they may be added together to produce density 5. Recently Optron Laboratories, Box 25, D.V. Station, Dayton 6, Ohio, started to mass-produce their Optron Solar Filters, which are of high-quality reflecting coated glass and are relatively inexpensive. The 2 1/2-in. size should be ample for most solar photography. It has a density value of between 4 and 5, which reduces the sun's intensity almost to that of the full moon, and is also useful for visual observation.

Solar photography enables you to take advantage of the slower but finer grained films. A medium-speed film, such as Verichrome Pan, used in conjunction with a density 5 filter, makes a good starting point for experiment. Try 1/60 second at f/11. If you want to photograph sunspot areas, or for any other reason want greater image enlargement, you'll need to use a lens with a clear aperture of 3 1/2 in. or better. One final word of advice: be sure your filter is attached to the lens so that it cannot possibly fall off when in use.

To the ends of space

After trying astrophotography with your ordinary camera, then with a small telescope, you may become a devotee, yearning after new worlds to conquer. If so, you can buy an equatorially mounted clock-driven telescope. They start at about \$80. With this, your camera can steadily and accurately follow objects in the heavens as they move across the sky, and all the planets, the great nebulae, star clusters, and even distant galaxies in the far reaches of outer space are yours for the taking. This isn't the place to cover such work in detail—but I can assure you that with modern equipment and films it is not difficult. The photos on page 63 give some idea of what there is for you to photograph and what other amateurs have accomplished. More information is given in the pamphlet *How to Use Your Telescope*, published by Edmund Scientific Co., Barrington, N.J., price 60 cents.

What telescope should you buy for more serious work? A 3- or 4-in. aperture refractor (featuring a direct view through an all-glass optical system) is very convenient, particularly if you want to use it for ground-level photography as well. But undoubtedly the best investment is a compact 6-in. equatorially-mounted mirror reflector, available in many good makes. There's a Criterion Dynascope at about \$200 complete with clock drive. For the "assemble it yourself" individual, the 6-in. reflector tele-

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scope components by Cleveland Astro-nomics, Box 209, Chagrin Falls, Ohio, make a well-designed, sturdy instrument which, in my opinion, is an excellent buy. The addition of an economical clock-drive from Edmund Scientific Co. (address above—ask for their free catalogue) completes a fine instrument for photographic or visual use.

Let me say it again: all the photographs reproduced here were taken by amateurs. At the more advanced level, many amateurs can do and are doing valuable scientific work with their cameras, supplementing the researches of the professional observatories. But however simple the equipment with which you decide to shoot the sky, I know you can achieve fascinating and worthwhile results. Good hunting!—HENRY PAUL

Editor's note: Dr. Henry Paul is the author of a new book, Outer Space Photography for the Amateur, which is shortly to be published by Amphoto, 33 W. 60th St., New York 23, N. Y. Price: \$2.50.

WHAT YOU'LL NEED (Continued from page 62)

the camera can be shifted or swung quickly from the viewing to the taking position. This is fairly easy to arrange with the reflecting telescope couplers, not so easy with refracting scopes. In this case, you may prefer to couple the scope straight to the taking lens and focus as described below.

If you're using a rangefinder 35mm or a Polaroid 110 or 110A, set the camera lens at infinity and focus the telescope visually (with glasses on, if you wear them). This will not give precise results, so it's best to check the focus with one or two test exposures. If you have a small telescope (or a binocular or monocular) in addition to the telescope you're using, you can improve your focusing precision in this way: focus the supplementary scope visually, then place its objective against the eyepiece of your main scope and adjust the latter for sharp focus. You can then remove the small scope and couple the cameras—set at infinity—as above. Focusing will be more precise still if the eyepiece of the supplementary scope is fitted with a reticle or ground-glass screen. The front lens of the camera should be placed behind the eyepiece in the Ramsden disc position, which should coincide with the surface for simple lenses and with the iris diaphragm for complex anastigmats. (To find this disc position, point the telescope at the sky or bright area and hold a white card behind the eyepiece. Move this back and forth to find the point where the projected beam is the narrowest, making a sharp circular bright disc of light—this is the Ramsden disc.)

Of course, if your non-reflex camera has a hinged or removable back, allowing you to place a ground glass at the

(Continued on page 130)

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DISCOVERY

(Continued from page 72)

In making the photograph of the succulent plant, page 72, Don Worth moved in close to frame the rain-washed, rosebud formation of the leaves. In shooting the bone-bare trees, page 73, he heightened contrast by shooting through a red filter. In each situation he used a technique to increase dramatic impact; in each situation he exaggerated one aspect of his subject and produced an image of startling simplicity and directness.

Worth's photographic education took place on the West Coast. His technical concern and control come as no surprise, for he has been working for the past four years as an associate of Ansel Adams, whose technical mastery is well known. Until 1954, when Worth became seriously interested in photography, he was a concert pianist, music teacher, and composer.

Whenever possible, Worth prefers to use slow films, such as Kodak Panatomic-X, even though shooting with the relatively large 4 x 5 format. "But certain situations require a higher speed film, such as Ansco Super Hypan. When photographing a leaf detail the high-speed film is very helpful—I can use a higher shutter speed and stop any movement caused by the wind."

Worth develops all films in a Pyro developer to produce high acutance negatives which have a complete range of detailed tones within the deepest shadows and brightest highlights. If the subject-lighting contrast is extreme, he will use a two-solution development pro-

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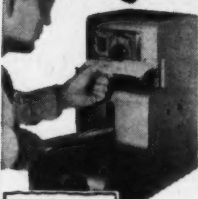
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cedure (D-23 and Kodalk) which effects proportionally greater development in the shadows than in the highlight areas.

Most of Worth's pictures are taken with a 4 x 5 Crown Graphic, with a 135mm Optar lens. "I find this camera excellent for photographing details, because of the wide depth of field of the relatively short focal-length lens. It's also light enough to be easily transported to locations in the field. For over-all landscapes, or whenever it is practical, I use an 8 x 10 Ansco View, with a Cooke Triple Convertible lens."

At present, Worth makes his living from commercial portraiture and architectural photography. At the same time, he continues to look to nature for subjects for his personal work.—P.C.

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50.95 Multiblitz Automatic Color SL Model	39.95

MINOLTA CAMERAS

	NEW SALE
\$264.00 SR2 Single-Lens Reflex w/f2 Automatic Lens with Case	\$169.50
79.00 "A" 35mm w/Coupled Range Finder, f2.8 Lens w/case	\$49.50
58.00 "A" 35mm w/Coupled Range Finder, f3.5 Lens w/case	39.00
161.45 Super "A" with f1.8 Lens-R.F. Removable Lens with Case	99.50

RETINA

List	United's Price
\$132.00 Retina IIC f2.8	\$69.00
175.00 Retina IIIC f2.8	94.25
157.00 Retina IIIS f2.8	95.00
199.00 Retina Reflex f2.8	135.00
235.00 Retina Reflex f1.9	169.90
15.00 Deluxe Cases for above	9.95
For IIC, IIIC & Retina Reflex	
77.00 35mm F4	58.00
77.00 35mm F4	58.00
80.00 35mm F4	58.00
For Retina IIS & Reflex: 58.00 35mm F4 w.A.	64.00
74.00 35mm f2.8 W.A.	52.00
78.00 55mm Tele.	54.95

NEW ARGUS CAMERAS—PROJECTORS

64.95 Argus C3 Match-Meter	\$49.50
119.50 Argus C35 Kit: Camera, Case, Meter	84.00
139.95 Argus C44 f2.8 w/Case & Flash & CM2 Coupled	99.50
149.95 Argus President 500 Wait 2x2 Fully Automatic Projector	95.00
134.95 Argus MT50 8mm 750 Watt Projector	87.00
59.95 Argus 335 300 Automatic Projector	44.00
74.95 Argus 345 500 Automatic Projector	54.95
99.95 Argus 555 500 Electronic Projector	72.00

EXPOSURE METERS

List	NEW	United's Price
\$ 84.50	G.E. Golden Crown w/case	\$22.50
35.95	Weston Master IV w/case, w/Invercone	27.00
10.50	G.E. Mascot II. w/case	7.30
29.50	Kodaklux Shoe w/case	18.95
9.95	Sekonic Clip-on LC2	6.95
11.05	Sekonic Leader Deluxe 138 w/built-in booster & case	8.95
32.50	Weston Master III w/case	21.95
7.30	Wals EV-1 Direct Reading	4.95
	Wals Norwood Super Director	13.95

NEW KEYSTONE MOVIE EQUIPMENT

CAMERAS 8mm	
\$124.50 K4C Electric-Eye w/3 f2 Lenses Turret f1.8 Lenses	\$64.50
149.50 K4 Deluxe Electric-Eye Turret f1.8 Lenses	98.00
169.50 K5 Electric-Eye Turret Magazine w/f1.8 Lenses	110.00
PROJECTORS 8mm	
64.95 K60 500 Watt f1.4	43.95
80.95 K90 500 Watt f1.4	59.50
109.50 K100G 500 Watt f1.6 Reverser	74.50
124.50 K110 500 Watt Zoom Lens	84.00
199.50 K110 Deluxe with Action Editor	139.00

SALE STAR-D - TRIPODS

Model D-18 Standard 3-Section w/Pan Head	\$11.95
Model D-20 Conquest 3-Section Elevator w/Pan Head	15.00
Model D-21 Universal 3-Section Elevator w/Pan Head	15.00
Model D-22 Mark III 3-Section Elevator Deluxe w/Pan Head	18.95

All Prices F.O.B. New York City

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TAKES MOST LENSES AND ACCESSORIES FOR EXAKTA

Exa with waistlevel viewfinder and
f2.9, 50mm Meritar preset coated lens

- Interchangeable lenses
- Interchangeable finders
- Built-In Synchronization M & X
- no parallax
- Pre-set & automatic lenses
- Automatic Exposure counter
- Direct vision sportsfinder

f/4.5, 100mm Isconar Telephoto.....19.50
f/4.5, 135mm Wirgar Telephoto.....34.50
f/3.5, 135mm Tele-Westanar.....39.50

EXAKTA

only **49.50**

Case & Flashgun9.95

Brand New 1960 **Royal 1.9E**

Save 60.75

Special

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with Built in Electric Exposure Meter and Luminous Coupled Range & Viewfinder

- Shutter speeds from 1 sec.—1/500
- Rapid film transport
- Automatic shutter cocking
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- Built in synchronization M & X
- Built in self timer
- High speed f 1.9, 7 element lens
- Deluxe Case & Folding BC Flashgun 9.95



Brand New 1960 **Regula**
Prontomat with Coupled Rangefinder

- The newest automatic electric eye camera from Germany
- Rapid transport lever
- Bright frame finder
- 7 Steps to f/23—Speeds to 1/300
- M-X Synchronization
- Coupled exposure meter
- 12.8 Anastigmat
- Coupled Rangefinder
- Deluxe Case & Folding BC Flashgun 9.95

Special Purchase Only.....**59.95**



Brand New **Sankyo 8-R**
8mm Movie Camera

- Three lens turret
- Through the lens focusing—coupled viewfinders
- 3-Focusing finders
- Deluxe rewinding device
- Automatic resetting counter
- 8, 16, 24, 32, 48 frames per sec.
- Dial for lap dissolves
- Single frame counter for 120.
- Frames animation
- Frame speed sprocket spindle
- complete with f1.4, 13mm Sankyo lens.....**99.50**
- F1.9, 36mm Telephoto and F1.9, 61mm Wide Angle lens in Jewelers Case . . . reg. 36.50. When purchased with Sankyo 8-R, you get both for only 19.50.
- OTHER SANKYO ACCESSORIES
- Pistol Grip.....6.95
- Electric Cell Exposure Meter.....8.95
- Leather Case.....8.95

Brand New **Rollop 2.8" Automatic**



The Automatic twin lens Reflex 2 1/4 x 2 1/4 camera with split-image range-finder at a popular price!
Never before a German Fully Automatic Reflex Camera with 2.8 Lens at this price!
• Automatic film advance

Shutter from 1 sec. to 1/500
• Built in selftimer

• Single shots for titles and animation

• 12.8 viewfinder lens

• 12.8 80mm Ennit taking lens

• Built-in Rangefinder

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only **79.50**

SPECIAL BONUS

All for only **49.95**

while quantities last

F1.9, 36mm Telephoto or F1.9, 61mm Wide Angle lens & Self-Timer given away free with purchase of Cinemax Camera.

Brand New **Cinemax Twin Lens Turret**

8MM Movie Camera

complete with fast f1.9, 13mm Cinemax Anastigmat lens

• 8, 16, 24, 32 frames per sec.

• Sample shots for titles and animation

• Speed governor control

• Etched telephoto viewfinder

• Precision construction throughout

Plus these Special Bonus Cinema Accessories which you get Free of Charge!

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case15.00

Brand New . . . From Every Angle . . .

The Sensation From The Continent of Europe

From Switzerland

The AUTO-CARENA

Fully Automatic 8mm Electric Eye Movie Camera with the quality of a 16mm camera

with F1.9 Anastigmat Lens!

This is the 8mm Movie Camera that was the HIT OF THE 1960

NATIONAL PHOTOGRAPHIC SHOW

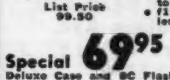
Auto-Carena Electric Eye Camera w/F1.9 Steinheil lens

only **149.50**

case15.00



Brand New 1960 new Automatic Sequence **Auto Terra**
with f 1.9 high speed lens repeating 35mm Camera



List Price 99.50

Special **69.95** (for a limited time only)

Deluxe Case and BC Flashgun.....9.95

- Auto Sequence
- Coupled Rangefinder
- Repeater Motor
- Diamond Frame Finder
- Self resetting exposure counter
- New type film speed indicator
- LVS System
- 10 shutter speeds to 1/500
- f1.9 high speed lens



Brand New **Super Dollina II** with Coupled Rangefinder and Genuine Carl Zeiss F2.8 50mm TESSAR lens

Super Dollina II fits into your pocket—a real candid precision camera! List 75.00

• Coupled Rangefinder

• Compur Rapid Shutter

• 10 speeds from 1 sec. to 1/500

• M-X flash synchronization

while quantity lasts.....39.95

Deluxe case and Flashgun.....9.95

Brand New **Honor 35**
with world renowned HEXANON F 1.9 50mm lens

- Coupled Rangefinder
- 10 speeds from 1 sec. to 1/500
- Takes all Leica lenses
- Time & Bulb
- F & X Flash
- Synchronization

only **99.95**

(for a limited time only)

This camera has features that you'd expect in a 250.00 camera!

The Lens Alone is Worth The Price!

Honor Camera Body only.....49.95

Honor with F2.8, 50mm lens.....79.95

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Honor Wide Angle lens: F3.5 35mm.....39.95

Honor Telephoto, F3.5, 135mm.....49.95

Steinheil F2.8, 85mm Tele.....49.50

Includes wide angle finder

Case and Flashgun.....9.95

Brand New 1960 **35mm Taron**

with fast f 1.9 coated 6-element lens

SPECIAL only **39.95**

- Coupled Rangefinder
- Speeds from 1 sec. to 1/500
- Rapid Advance Lever
- M-X Flash
- Synchronization
- Viewfinder coupled to Rangefinder—reg. 99.95
- Deluxe case and Flashgun.....9.95

LENSES

ANGENIEUX LENSES

for Leica

f 3.5, 28mm Retrofocus.....120.00 94.50

for 16mm & Bolex cameras

f 2.2 61mm—"C" Mount.....90.50 59.50

STEINHEIL Lenses

for 8mm "D" Mt.

f 3.5 30mm.....10.95 9.95

f 2.8 30mm.....20.95 19.95

for 16mm; "C" Mt.

f 1.5 25mm.....79.50 39.95

f 3.5 75mm.....29.95 14.95

for Praktica

f 2.8 85mm Culminar.....69.50 39.95

for Leica

f 2.8 85mm Culminar.....84.50 49.50

Enlarging Lenses

f 4.5 90mm.....16.50 12.40

f 4.5 105mm.....21.00 15.75

f 4.5 150mm.....59.95 44.95

f 4.5 210mm.....88.00 65.95

ZEISS LENSES

for Praktica

f 2.8 80mm Tessar.....79.50 49.50

for Exakta

f 4.0 135mm Triotar.....85.00 59.50

Wide Angle

f 4.5 40mm Tessar.....85.00 39.95

ENNA LENSES

for Praktica, Exakta & Xka

f 2.5 37mm P.S. Lithagon.....49.95

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Cases for Above.....2.95

FOR THE FIRST TIME!

Now Available in limited quantities

COUPLED RANGEFINDER GLASS

FOR ROLLEIFLEX AND ROLLEICORD!

to be inserted into your Rollei camera

SPECIAL ONLY.....29.95

Brand New

Wetax 2 1/4x2 1/4 Folding Camera with F 3.5 Meritar coated lens in Prontar S

Shutter—9 speeds

Special . . . while quantity lasts! only 19.95

Case and Flashgun.....9.95

Brand New **BEAU LIGHTOMATIC**

automatic electric eye 35mm camera

- Built-in Electric Eye
- Ultra-fast F1.9 lens
- Lever wind with automatic lock
- Automatic parallax corrector
- 11 speeds from 1 sec. to 1/500
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- Bright luminous viewfinder
- and many new, outstanding features!

Never before an electric eye precision camera with F1.9 lens at this price!

Case and Flashgun.....9.95

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Brand New **BEAU SUPRA**

1.8 AUTASET

with built-in parallax corrector

- F1.8 super-fast lens
- Built-in Ultra Violet Filter for Color
- One stroke lever wind
- 10 shutter speeds from 1 sec. to 1/500
- Coupled Rangefinder
- Luminous viewfinder
- M-X flash synchronization
- and many new, outstanding features!

Never before a precision 35mm camera with F1.8 lens at this price!

Brand New Beau Super with Coupled Rangefinder F2.8 lens, speeds from 1 sec. to 1/500.....39.95

DELUXE CASE AND FOLDING BC Flashgun for above.....9.95

only **49.95**

Case and Flashgun.....9.95

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35mm Coupled Rangefinder Camera

- F2.8 coated lens
- Prontar SVS Shutter
- Speeds 1 sec. to 1/300
- Flash Sync. on all speeds
- M-X Synchronization
- Self-timer

List 49.95

SPECIAL only **29.95**

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Brand New **Auto Terra**

with f 1.9 high speed lens repeating 35mm Camera

- Auto Sequence
- Coupled Rangefinder
- Repeater Motor
- Diamond Frame Finder
- Self resetting exposure counter
- New type film speed indicator
- LVS System
- 10 shutter speeds to 1/500
- f1.9 high speed lens

List Price 99.50

Special **69.95** (for a limited time only)

Deluxe Case and BC Flashgun.....9.95

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Super Dollina II fits into your pocket—a real candid precision camera! List 75.00

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- Compur Rapid Shutter
- 10 speeds from 1 sec. to 1/500
- M-X flash synchronization
- while quantity lasts.....39.95
- Deluxe case and Flashgun.....9.95

only **149.50**

case15.00

Brand New **35mm Taron**

with fast f 1.9 coated 6-element lens

SPECIAL only **39.95**

- Coupled Rangefinder
- Speeds from 1 sec. to 1/500
- Rapid Advance Lever
- M-X Flash
- Synchronization
- Viewfinder coupled to Rangefinder—reg. 99.95
- Deluxe case and Flashgun.....9.95

ANGENIEUX LENSES

for Leica

f 3.5, 28mm Retrofocus.....120.00 94.50

for 16mm & Bolex cameras

f 2.2 61mm—"C" Mount.....90.50 59.50

STEINHEIL Lenses

for 8mm "D" Mt.

f 3.5 30mm.....10.95 9.95

f 2.8 30mm.....20.95 19.95

for 16mm; "C" Mt.

f 1.5 25mm.....79.50 39.95

f 3.5 75mm.....29.95 14.95

for Praktica

f 2.8 85mm Culminar.....69.50 39.95

for Leica

f 2.8 85mm Culminar.....84.50 49.50

Enlarging Lenses

f 4.5 90mm.....16.50 12.40

f 4.5 105mm.....21.00 15.75

f 4.5 150mm.....59.95 44.95

f 4.5 210mm.....88.00 65.95

ZEISS LENSES

for Praktica

f 2.8 80mm Tessar.....79.50 49.50

for Exakta

f 4.0 135mm Triotar.....85.00 59.50

Wide Angle

f 4.5 40mm Tessar.....85.00 39.95

ENNA LENSES

for Praktica, Exakta & Xka

f 2.5 37mm P.S. Lithagon.....49.95

f 3.5 28mm P.S. Lithagon.....39.95

Cases for Above.....2.95

FOR THE FIRST TIME!

Now Available in limited quantities

COUPLED RANGEFINDER GLASS

FOR ROLLEIFLEX AND ROLLEICORD!

to be inserted into your Rollei camera

SPECIAL ONLY.....29.95

Brand New

Wetax 2 1/4x2 1/4 Folding Camera with F 3.5 Meritar coated lens in Prontar S

Shutter—9 speeds

Special . . . while quantity lasts! only 19.95

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Brand-New 1960
Kodak RETINA Cameras

RETINA IIIC	w/Xenon f2.8/50mm	89.50
RETINA IIIS	w/Xenon f2.8/50mm	89.50
RETINA IIIS	w/Curtaragon f2.8/35	129.50
RETINA IIIS	w/Xenon f1.9/50	129.50
RETINA Reflex S	w/f2.8/28mm	169.50
	w/f2.8/35mm	159.50
	w/f2.8/50mm	124.50
SOLD ONLY WITH CASE	w/f1.9/50mm	156.95
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Curtar f5.6/35mm 27.50
Curtar f4/35mm, shade & case 48.50
Longar f4/80mm, shade & case 58.50

LENSES for IIIS & Reflex S:
f4/28mm 63.95
f2.8/35mm 73.95
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f1.9/50mm 62.95
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Accessories for ALL Retinas

Brand new! Specify camera when ordering.
50mm Lens Comp. Case 1.50 1.05
Tele Aux. Lens f1/60 13.25 9.25
50-80 Sports Finder 8.25 5.75
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Optical 35-50 Finder 15.50 10.25
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Screw-in Filters 32mm 4.50 3.15
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Fitted Case deluxe 34.50 24.50



YASHICA PENTAMATIC
Automatic mirror return, auto. stop-down diaphragm, pentaprism finder, speeds to 1/1000th, full sync., one-stroke advance lever.
WITH F1.8 Auto Yashinon lens Mfr. sug. list \$159.95

OUR SPECIAL ONLY \$119.50

First Time Anywhere!

Genuine Carl Zeiss
to fit Retina Reflex & Ret. Reflex S*

8x30 monocular attachment increases focal length of normal lens 8x. Converts your normal lens to 400mm tele.

Case 5.95
*fits only f2.8 lens
Also available for all Contaflex.

\$69.95



Brand-New Autom.

PENTACORD F

Popular S.L.R. with Carl Zeiss, Jena f2.8 Auto Tessar, autom. diaphragm lens control, 1/1000th, flash synchr. etc.

Mfr. Sug. List **\$89.50**

OUTFIT compl. with Pentacord F camera, prism viewfinder, f2 autom. Biotar, f4.5/100mm Tele, BC flash, Ext. tube set, Eveready case.

Only **\$129.50**

MINOX B

VERY LATEST

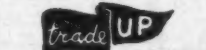
The fabulous miniature with built-in exposure meter

- Sharp f3.5 Color-corrected coated lens
- Synch for flash and Speedlights
- Shutter speeds to 1/1000th
- Just 3 1/2 inches long - weighs 3 1/4 oz.

ONLY **\$119.50**

MINOX Accessories (used)

Camera clamp \$4.20
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Right Angle Finder B & B 6.95
Reflex Viewfinder 10.50
Binocular clamp 17.50
Transparency viewer & cutter 10.50
Film viewer magnifier 4.95



to these newest cameras. All trades subject to inspection of your equipment.

RETINA REFLEX S

f2.8 XENAR \$49.50 + your Retina Reflex

RETINA REFLEX S

f1.9 XENAR \$89.50 + your Retina Reflex

CONTAFLX SUPER

f2.8 TESSAR \$59.50 + your Contaflex IV

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f2.8 TESSAR \$54.50 + your Contaflex III

NIKON F REFLEX

f2 NIKKOR \$154.50 + your Nikon S-2, f2 lens

EXAKTA VX IIA

(body for body) \$44.50 + your Exakta VX Single Flash Past Body

EXCELLENT BUYS in used CONTAFLX



CONTAFLX Super ONLY

with f2.8 Tessar... **\$119.50**

CONTAFLX Rapid ONLY

with f2.8 Tessar... **\$89.50**

CONTAFLX III ONLY

with f2.8 Tessar... **\$74.50**

CONTAFLX IV ONLY

with f2.8 Tessar... **\$94.00**

Case for III or IV... Only \$6.00

Super or Rapid Case... Only \$8.95

Immediate delivery on Brand-New PRO-TESSAR

F4/35mm lens **\$62.50**

Mfr. Sug. List \$98.90

ONLY **\$69.50**

Mfr. Sug. List \$98.00

Case to hold both lenses. Sug. List \$16.00, ONLY \$11.95.

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Filters, screw-in, b&w... 3.65
Filters, screw-in, color, new... 4.40
Filters, 60mm screw-in... 9.30
Lens Shade... 1.40
Pro-Tessar M 111... 38.40
Monocular 8x30 B... 69.40
400mm Tele att... 5.05
Case for above... 3.65
Prism close-up lens... 8.05
Proxar Close-up Lenses set of 4... 13.40
Contaflex Polarizing Filter... 6.65
Right Angle Viewfinder... 13.40
Contaflex 48C... 4.95
Book "Contaflex" Way... 3.95

Brand-New Original IHAGEE LIGHTMETER Pentaprism

with Auto split-image RF for Exakta & Exa cameras

ONLY **\$44.95**

RangeFinder 8.95 Case Only \$2.95

Brand-New Genuine Ihagee PENTA-PRISM Black Top

f. Exakta, V, VX & Exakt Split Image Rangefinder.

ONLY **\$28.95**

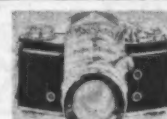
Brand-New Genuine Ihagee WAIST-LEVEL FINDER

for Exakta, Exa, etc. all models

Case **\$2.25** ONLY **\$9.95**

ON C.O.D.—10% deposit. include postage on all prepaid orders.

(Excess refunded)



BRAND NEW Latest Automatic EXAKTA VX IIA

• The Finest and Most Versatile 35mm Single Lens Reflex

With Ihagee Pentaprism Eyepiece Viewfinder, autom. Split Image Rangefinder, Focal Plane Shutter with speeds to 1/1000. Many more deluxe features.

• All with Guarantee Certificate & Owners Registration.

With Auto Biotar f2/58mm \$299.50

With Auto Quinon f1.9/55mm... \$359.50

With Auto Xenon f1.9/50mm... \$360.00

BRAND NEW AUTOMATIC LENSES

24mm f4 Isco Westragon 149.50 119.50

35mm f2.8 Steinheil Quinaron 149.50 119.50

135mm f2.8 Steinheil Auto Quinar 189.50 159.50

135mm f2.8 Isco Tele Iscaron 150.00 119.50

BRAND NEW PRE-SET LENSES

180mm f2.8 Isco Tele Iscaron 200.00 159.50

200mm f4.5 Steinheil Quinar 149.50 119.50

400mm f4.5 Tele PIESKER P.S.

Hard, ctd. for Exakta, Praktica, Pentacord, Pentax, etc.

ONLY **\$87.50**

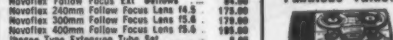
200mm f3.5, P.S. \$77.50

Famous WESTON MASTER IV Exp. Meter

Reflected & Incident light reading simplified exp. dial, double sensitivity, better readability. List \$35.95

OUR PRICE **\$25.50**

Fabulous Value!



Famous **GRUNDIG**

Tape Recorder, Dual Track, Transistors, Battery powered

List \$99.95 **BRAND NEW ONLY \$59.95**

Featherweight TELE 16.7/400mm preset lens

List \$4.50 **ONLY \$9.95**

Eye Piece (Rubber) 4.40

Range Finder Glass 9.95

Microscopic Eye Piece 21.00

Slide Sequence Motor 18.50

Extension Bellows 42.00

Extension Tube Set 13.00

Ground Glass Focusing Screen 3.95

Waistlevel or Prism Case 2.25

Microscope Adapter 21.00

Folding Bellowscope 10.95

Revolving Disc Track Bellowscope 17.50

Ihagee Type 2 to 1 Adapter 5.55

Extensio Tube Set (3) 4.95

Ihagee Type Microscope Adapter 9.95

*IMPORTANT: Praktica, Exakta-Reflex, Praktiflex FX, Reflex, Hexagon, Contax, Contax D, Astrolux, Contax S, Pentax have same lens thread as Pentacord.

*Latest design with automatic depth of field indicator

THE ABOVE IS ONLY A PARTIAL LISTING, due to limited space. Write for prices on other lenses & accessories!

All Kihitt Lenses USED

• All prices subject to change without notice

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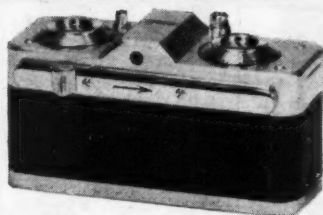
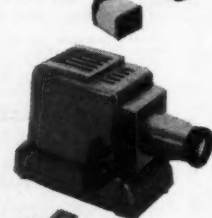
(Continued from page 90)



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THE MOST COMPLETE SYSTEM
OF SUB-MINIATURE
PHOTOGRAPHY

Mikroma II



Some outstanding features of the Mikroma II

The MIKROMA II is a Precision European-made miniature-type camera, has attained the most valuable recognition—a GOLD MEDAL at the World Exhibition at Brussels.

- Uses 16mm standard movie film
- Small in size, light in weight the camera can be carried at any occasion
- Rapid sequence shots are made easy with the combined film-transport and shutter-setting lever
- Double-exposure prevention device
- Up to 50 pictures at a loading
- Partly exposed film can be cut off and developed
- Great depth-of-field helps to conceal errors of distance estimation
- From correctly processed negatives exhibition prints may be made
- Colour slides can be projected to large sizes
- A wide range of accessories extend the usefulness of the camera
- Its many other advantages make the Mikroma II an ideal family camera

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Lens: 3 element 20mm MIRAR 13.5 to f16.
Shutter: speeds from 1/5 to 1/400 sec. & B.
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AND MOST AMAZING: you can sell the camera with choice of cases and the complete line of accessories for less than \$150.00. The camera itself sells at \$37.50 including case.

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PFA SHOW

(Continued from page 90)

photography is a comparative infant art, some giants do stand. Why not stick with the established masters? Such a show would offer a basis on which to understand the development of the art, a frame of reference which would become an educational tool for the general public, which is appallingly ignorant of the esthetics of photography.

If, however, PFA is to reflect the new, its selection should be confined to work of a current nature. (And here let us say that PFA 2 is terribly old hat with

but one truly exciting and new photograph, John Stewart's *Flowers*. The rest of the pictures have been matched in many a photo annual and surpassed by several of the shows at The Museum of Modern Art and George Eastman House.) Why not seek the avant-garde, the non-established, the arguable?

The Metropolitan should be the place, not just to drag in crowds to see a pleasant little show of miscellany photographs, but to educate and inspire the public to a new respect for the fine art of photography. We doubt the value of the commonplace in accomplishing this purpose.—THE EDITORS

Museum of Modern Art has exhibited, collected and purchased photographs almost from the time of its inception. Since 1932 it has organized and presented seventy photography exhibitions, mainly under the curatorship of Beaumont Newhall and later Nancy Newhall, until the end of World War II, and under my direction for the past twelve years. The work of over 800 photographers has been included in these shows. We have also sent out forty circulating exhibitions to sister institutions throughout the country, as well as to museums in Europe and Asia. You may not know, of course, although many people do, that this Museum has a collection of over 5,000 prints. I know that you saw the large comprehensive historical survey of "Photographs from the Museum Collection," on view in our first floor galleries from November 26, 1958 to January 18, 1959. This exhibition antedated your project by several months. In the display of pictures selected by the special jury for The Metropolitan Museum of Art show inaugurating the *Photography in the Fine Arts* project (May 8-September 7, 1959) there were fifty-five photographers, of whom forty-three are represented in the collection of The Museum of Modern Art. Furthermore, thirty-five of the fifty-five participants were included in the above-mentioned exhibition from the collection of the Museum of Modern Art.

"Therefore, you have been guilty of deliberately misrepresenting the position of photography in the fine arts. I think, however, that the most reprehensible aspect of your activities is the abuse of the good offices of one of our most important magazines, the *Saturday Review*. Also, I cannot understand why The Metropolitan Museum of Art accepted *Photography in the Fine Arts*, and, acting on your suggestion, asked the photographers to present their prints to the Metropolitan, probably one of the richest art museums in the world. If they accept photography as a fine art there, for the love of Mike why not treat the photographers as they do other artists, and buy their works?

"The views expressed in this letter are personal, but the Museum shares my conviction that, considering the facts, it can in no way support your project.

"Very sincerely yours,
"Edward Steichen"

"Dear Mr. Steichen:

"Even though I was not too surprised at your refusal to serve on this year's PFA jury of selection, I had hoped that after a year of deliberation your attitude
(Continued on page 134)

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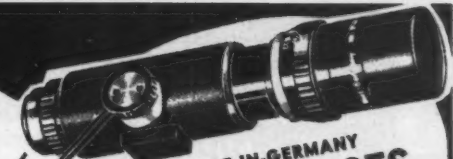
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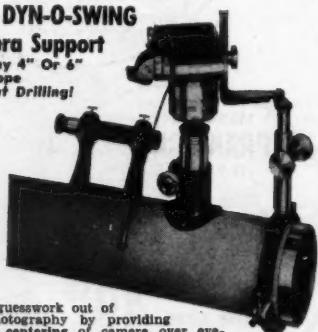
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FLOWER MOVIES

(Continued from page 88)

8mm or 100 ft. of 16mm film. The story concerns one day in the life cycle of a garden. It starts with a sunrise and then progresses to an introductory shot of the flowers. Both scenes in the sequence are brief and are followed by a time-lapse shot of a flower opening. Then, our home gardener enters and after a medium and close-up shot, following close-ups show the flowers almost as she sees them. In the final scenes, she gathers flowers and then arranges them indoors. In the last shot we see the finished arrangement.

The script is designed to take advantage of movement within the frame itself, but also has a change of pace from scene to scene. The flowers are always on screen—but in a variety of ways to make the film move along. The first flower shot is a close-up—with little movement. The next one (a time-lapse sequence) picks up the pace somewhat. Following that, the woman enters the garden to provide even more movement. The series of close-ups on page 89 are designed for quick cutting from one flower to another. Each cut is accompanied by a change of angle and framing to add variety. Even the scene in the house is designed to provide movement and change—from outdoors to indoors. The transition is established in the flower cutting scene that precedes it.

It isn't complicated

Actually, this type of movie requires much less in the way of technique than you think.

Details of the sunrise sequence and the lighting of the following close-up are given in the caption accompanying the photographs on page 88. However, while shooting good movie close-ups isn't much more difficult than any other movie shot, a bit more attention must be paid to details. Let's discuss technique.

Choose backgrounds carefully. In some cases you may find that an effective low-angle close-up can be made using the sky (or the sun) as a background. Remember to take your meter reading from the flower, not the sky, unless you want a silhouette effect. Take a reading from a gray card with a reflected light meter, or use an incident meter. A pond or lake can also supply an excellent background. If the water's quite still, try dropping a pebble into it as you begin shooting, to create movement.

Take advantage of shallow depth of field. When you shoot extreme close-ups, backgrounds tend to go out of focus because of exceedingly small depth of field at short camera-to-subject distances. This can be useful when backgrounds are busy—tangled growth, bushes, and the like. The out-of-focus

effect provides a non-objective design backdrop for the flower, helping to emphasize the shape, texture and color.

Keep your backgrounds simple so you can match outdoor and indoor close-up footage if you have decided to shoot some of your flower subjects indoors—out of reach of weather and wind. For example, if you use a black background indoors, it's possible later to match the shot with an outdoor one which has some shadow area in the background. Concentrate light on the flower, letting the background take care of itself.

Don't get too much movement in a flower close-up. The tighter the shot, the more erratic the whipping motions caused by the wind will appear on the screen. If your camera is equipped with slow motion speeds—32, 48 or 64 fps—use them to smooth out and slow down the movement on screen. In fact, a rather irritating bit of footage can be turned into a rather graceful looking sequence. Remember, open the lens $\frac{1}{2}$ f-number for every 8 fps over normal speed to compensate for the faster shutter.

If you have a zoom lens, use close-up lenses with it to shoot scenes that go from a framing of the entire flower to one that shows a tiny detail of the inside of the blossom. I've found that combining a +2 and +3 close-up lens with the zoom lens focused at infinity and the lens positioned only 8 in. from the subject is effective for most flowers.

Actual focusing and framing of flower shots can be a chore if you don't have through-the-lens focusing and viewing. However, "The Movie Maker," page 30, offers some fairly easy ways to assure good framing and sharp images with cameras equipped with separate finders.

—ERNST WILDI

OUTER SPACE

(Continued from page 123)

focal plane, you can attach a small magnifier and focus directly on this ground-glass screen.

Finally, in setting the exposure for your camera-telescope combination, never use the camera aperture stops. Always leave the lens wide open and control your exposure only by shutter speed—if you don't, vignetting or light loss at picture corners may occur. The telescope fixes the f-speed of the system to a low value. To find the f-value number for your system, multiply your camera lens focal length (in inches) by the eyepiece magnification and divide by the telescope lens diameter (in inches). For example, if you have a 50mm (2-in.) camera lens, 20X eyepiece and 60mm (approx. 2 1/2-in.) scope, the calculation will be $2 \times 20 = 16$, which means that

$\frac{2.5}{16}$

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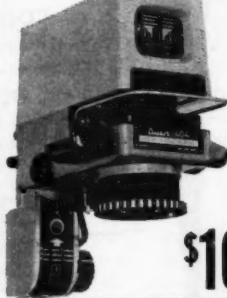
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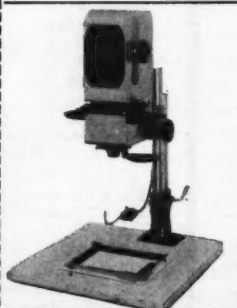
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THE LARGE CAMERA

(Continued from page 56)

substitute for the telephoto lens that was too expensive for a limited budget—provided the photographer does not mind their weight and bulk and the long bellows extensions they require.

6. **Telephoto:** The lens consists of two widely separated components—a positive front element and a negative rear element. The practical result of this unorthodox construction is that telephoto lenses require proportionally less bellows extension than ordinary lenses of the same focal length. On the other hand, as a rule, ordinary lenses are capable of better performance in terms of sharpness and definition than telephoto lenses of comparable focal lengths and speeds. The following telephoto lenses can be particularly recommended: Tele Tessar (Carl Zeiss), Dallmeyer Telephoto, Schneider Tele-Xenar. All are available in different focal lengths ranging from 12½ up to 30 in. with apertures between f/4.5 and f/6.3.

How to find your way through this jungle of different lens designs, and how to finally select and test the lens of your choice, will be the subject of future columns.—THE END

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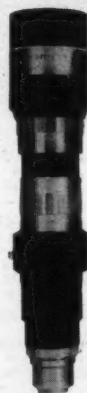
"I have no wish to quarrel with you, sir, indeed quite the reverse. A warm relationship between all of us would be far more beneficial to those concerned with photography than your indulgence in vilification.

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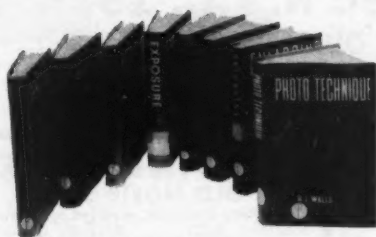
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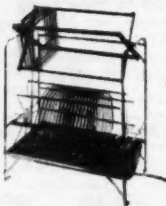
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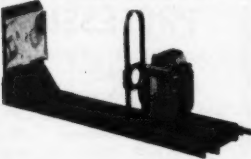


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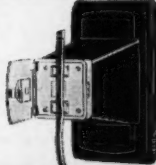
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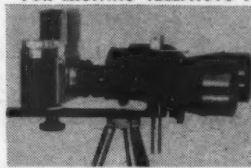


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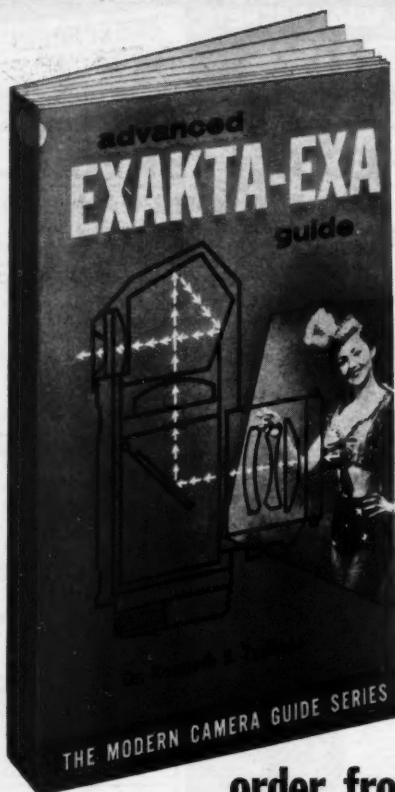
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